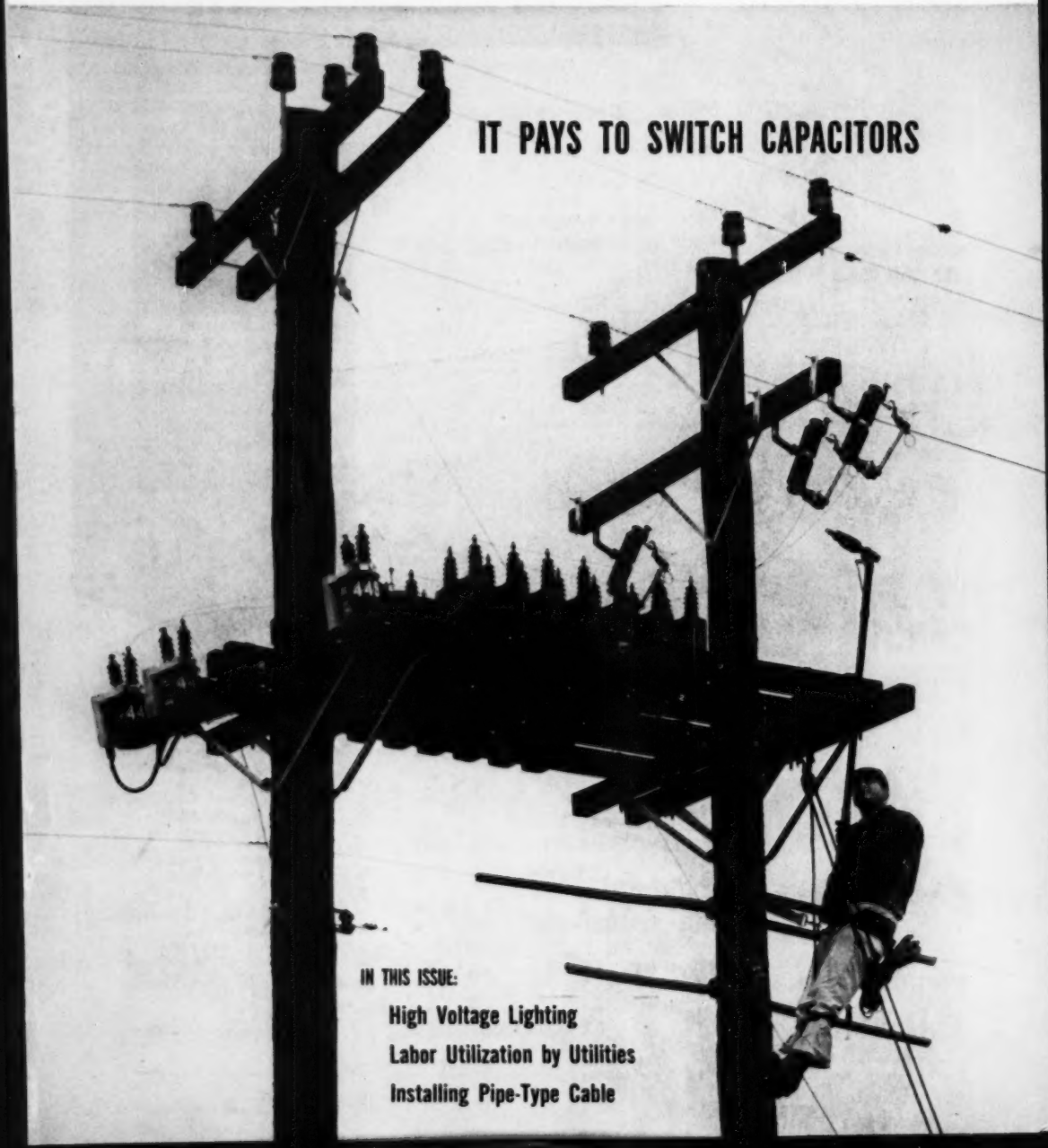
MARCH 10, 1952

Electrical World

Price 35 Cents

A McGRAW-HILL PUBLICATION



IT PAYS TO SWITCH CAPACITORS

IN THIS ISSUE:

High Voltage Lighting

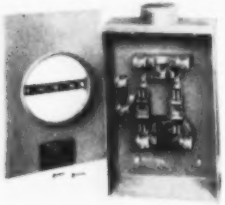
Labor Utilization by Utilities

Installing Pipe-Type Cable

SIMPLIFY your meter mounting problems....choose from the COMPLETE Murray line

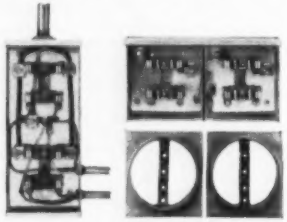
OUTDOOR METER SOCKET

Single or multiple units (saves nippling in the field). Provisions for fifth and sixth jaws. Reversible jaws for vertical or horizontal mounting. Two or three hubs—1" or 1¼". Pressure connectors. Finished in gray baked-on Melamine (a really rugged finish).



OUTDOOR WEATHERPROOF—RAINTIGHT METER SOCKETS

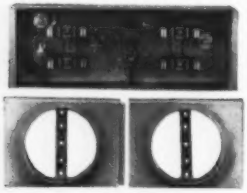
A medium duty socket. Contact surfaces of jaws are silver plated. Single phase installation can be converted to polyphase by substituting polyphase blocks. Sturdy cabinet, built of corrosion resistant steel. The finish is baked-on Melamine. Deep lipped top with hub for 2" conduit, is welded to sides and back. Cover slides under top, over sides and bottom, making device completely raintight. An economical unit.



OUTDOOR SOCKET METER TROUGHS

(Vertical or Horizontal)—

Single or multiple units. On multiple units, line and load terminals at each meter position are lay-in pressure type connectors, which simplify bussing. Line connectors for #4 to #3/0 cables. Load connectors for #4 to #1/0 cables. Made in sizes to accommodate from one to six meters.



INDOOR SOCKET METER TROUGH

(Horizontal)—

Available in one to three meter positions. Can be ganged readily. Line and load terminals are pressure type. Line connectors for #4 to #3/0 cables, load connectors for #4 to #1/0 cables. Lay-in connectors simplify wiring.

TYPE H. D. HEAVY DUTY METER MOUNTING DEVICE

Has a maximum continuous carrying capacity up to 200 Amperes. Can be used with any standard 4 or 5 terminal meter on 1, 2 or 3 phase, 3 wire installations. Where the standard 50 Ampere meter is used, the heavy duty mounting is suitable for 200 Amperes intermittent duty and 150 Amperes continuous duty. Vise-jaw terminals for high-strength, high conductivity. Pressure connectors take line conductor sizes from #6 to #4/0. Equipped with transparent acetate shield for safety in installation and testing. By-pass clamps permit removal or testing of meter without interrupting load. Corrosion resistant, weatherproof case. Supplied with 2" or 2½" hubs.

MODIFIED OUTDOOR SOCKET METER TROUGH

An economical device for those whose requirements call for a compact, single position unit. Plenty of wiring room. All connectors are pressure type and take up to #1 wire. 1" or 1¾" hubs available. Melamine finish.

COMBINATION METER SOCKET AND SERVICE CONTROL EQUIPMENT

Murray meter sockets are available in combination with service control equipment. Factory assembly assures a rock-solid, perfectly aligned unit. Service control equipment includes Fully Magnetic Circuit Breakers. Murray Magnetic Breakers always carry the full load, are never affected by ambient temperatures. The sun's rays, for instance, will never cause Murray Breakers to trip. Both socket and service control equipment are finished in baked-on gray Melamine.

Murray can fill all your needs for socket type meter mounting equipment. You can choose any device you need—from the round socket to heavy duty equipment. Ordering and stocking or specifying are simplified when you buy from one source.

Murray

MURRAY MANUFACTURING CORPORATION

1250 Atlantic Ave., Brooklyn 16, N. Y.

Service Entrance & Meter Equipment • Magnetic Circuit Breakers • Switches • Current Limiting Reactors • Crows'nest Aerial Ladders.

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Please send me the catalog page and any other literature on the items listed below.

1. Outdoor Meter Socket ..... ☐
2. Outdoor Weatherproof—Raintight Socket ..... ☐
3. Heavy Duty Meter Mounting Device..... ☐
4. Outdoor Socket Meter Troughs
   - Vertical ..... ☐
   - Horizontal ..... ☐
5. Modified Outdoor Socket Meter Trough.. ☐
6. Indoor Socket Meter Trough..... ☐
7. Combination Meter Socket and Service Control Equipment ..... ☐

Name _____

Title _____

Company _____

Address _____

City _____ State _____

A SPECIAL MENU

Like a competent housewife planning the family meals, Electrical World tries to offer a balanced menu to its readers in each issue of the magazine. But on a special occasion—say a birthday—the housewife may depart a little from the rule of balanced fare to please a particular taste. That, we think, may be permitted to the editors also.

A special occasion is coming up. It is the Annual Sales Conference of the Edison Electric Institute, March 31-April 4, in Chicago. In recognition of this occasion, Electrical World will cater to the commercial man by somewhat overbalancing its next issue, just before the Conference, in his favor. But the engineer will not be overlooked. The issue will also contain plenty of meat and potatoes for him, as usual.

Vigorous merchandising of appliances is the policy of Toledo Edison. C. A. "Chuck" Harrison, vice-president, tells why. His thesis is simple. The company's business is to sell kwhr. But nobody buys kwhr just for the pleasure of seeing them scamper about—assuming they could scamper and could be seen. They are bought for the work they will do. Therefore the utility must see to it that its customers have lots of appliances. And the best way to do that is to take the lead in selling them, particularly the newcomers and the slow starters that have not yet won general user acceptance. Mr. Harrison backs up his argument with figures and other evidence to prove it is right.

The second dish is a piece by J. M. "Chub" Stedman, stemwinder of Pennsylvania Power & Light's commercial department. He discloses the company's sales plans for 1952. They embody a three-fold promotion—to sell more kwhr, to improve customer relations that are already good, and to forward the cause of American free enterprise.

As dessert to follow the toothsome dishes prepared by Chuck and Chub, there is the report of a survey on appliance merchandising by power companies. It shows how many companies merchandise, where they are, and what they sell, and how many companies co-operate with dealers and how.

Electrical World

Published for 78 years for those engaged in the business of generating, transmitting, distributing, or applying electric power

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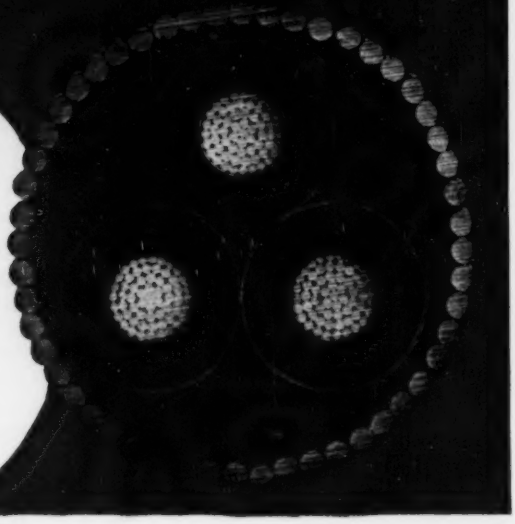
OKONITE SUBMARINE CABLE CROSSINGS



57 CIRCUIT MILES INSTALLED BY FIVE UTILITIES PROVE OKONITE CABLES CAN TAKE IT

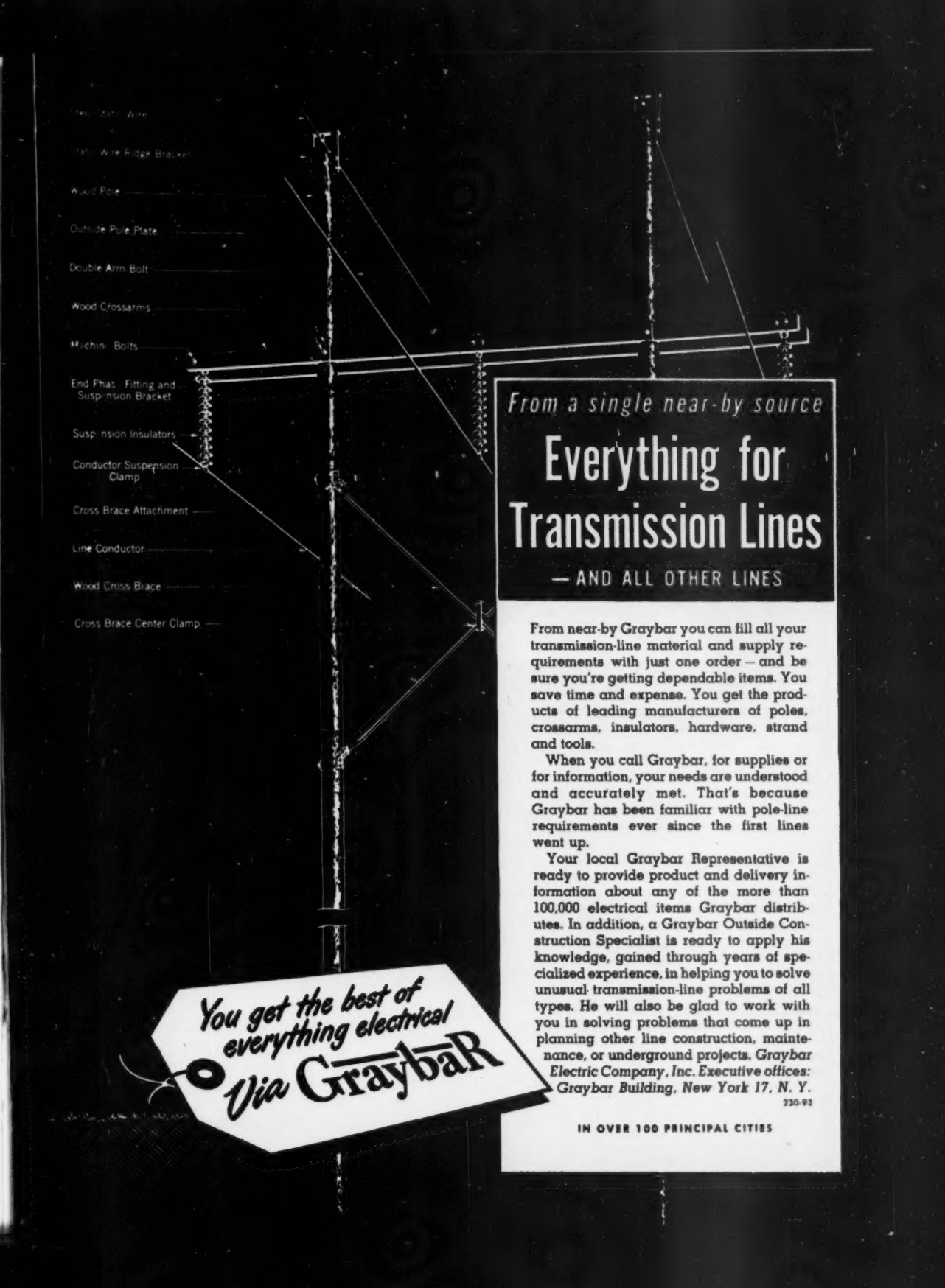
Date	Footage	Location
1926	20,700 ft.	President Point
1926	20,700 ft.	President Point
1926	15,000 ft.	Lake Union
1930	15,000 ft.	Fox Island
1931	16,000 ft.	Vashon Island
1931	25,000 ft.	Lake Washington
1931	15,000 ft.	Mercer Island
1933	10,000 ft.	Hood's Canal
1935	23,000 ft.	Lake Union
1936	10,000 ft.	McNeill Island
1939	8,500 ft.	Hood's Canal
1939	2,000 ft.	Lake Union
1940	22,000 ft.	President Point
1942	5,000 ft.	Bainbridge Island
1945	22,000 ft.	President Point
1950	16,000 ft.	Vashon Island
1951	39,200 ft.	San Juan Islands (2)
1951	12,000 ft.	San Juan Islands
	297,100 ft.	

When you specify Okonite rubber-insulated cables—for *any* purpose above or underground—you are sure of dependable year-in year-out performance. For you get electrical insulation designed for the job and a covering engineered to protect that insulation during its full life span under the specified operation conditions. You also get the advantage of Okonite's proved manufacturing techniques, such as insulation applied by the strip process and vulcanization in a metal mold. These are your assurance of long-lived, trouble-free electrical circuits.

Installations in all voltage ranges and under the most exacting conditions are proving every day that Okonite is your most economical cable buy. The Okonite Company, Passaic, N. J.

The best cable is your best policy

OKONITE SINCE 1878 *insulated wires and cables*



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FWD offers 78 combinations of trucks and equipment

to answer a wide range of needs

FOR CONSTRUCTION — Consists of earth-boring machine with integral derrick, winch and platform body . . . on light-duty, medium-duty or heavy-duty FWDs.

FOR MAINTENANCE— Conventional 3-man cab with line maintenance body, winch, derrick. Combines with light-duty, medium-duty or heavy-duty FWDs.

FOR MAINTENANCE — 2-man cab over engine style with crew compartment in maintenance body. Winch and derrick. Matched with medium-duty FWD chassis.

FOR MAINTENANCE — Conventional 3-man cab with crew compartment in maintenance body. Winch and derrick. For light-duty, medium and heavy-duty FWD's.

GENERAL PURPOSE TRANSPORT — H 6 x 6 with 5th wheel for use with lo-boy, semi-trailer, full 4-wheel or pole trailer. Winch mounts behind 3-man cab. Tool compartment under platform.

FOR CONSTRUCTION (and maintenance of energized lines) — For one-man operation. Patented front-mounted earth-boring machine with integral telescopic derrick — rear-mounted engine — winch. For heavy-duty FWD.

ALL-PURPOSE LINE MAINTENANCE AND CONSTRUCTION — 2-man cab-over-engine. Crew compartment in combination platform and line body. Includes earth-boring machine, derrick, winch. For medium-duty FWD.

FOR MAINTENANCE — Heavy-Duty 6 x 6 has 2-man cab over engine. Crew compartment built into maintenance body. Matched combination includes winch and derrick.

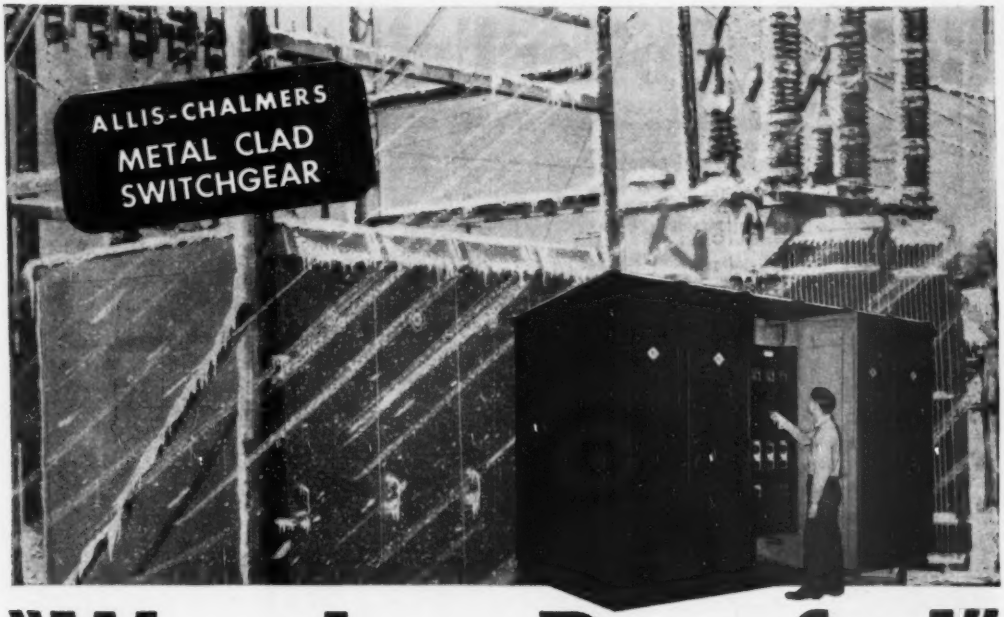
FWD is the central source for complete mobile workshops . . . including cabs, winches, derricks, boring machines, platform and line bodies. These components, mounted on famous FWD chasses, give you an unparalleled choice for line maintenance and construction.

Specify FWD to lower your costs and accelerate schedules on both routine and emergency service.

Ask for a copy of the new FWD "Code Book," which makes it easy for you to select the motorized unit best suited to your work. In addition, we will show you a 30-minute movie, demonstrating outstanding FWD performance.

THE FOUR WHEEL DRIVE AUTO CO., Clintonville, Wis. • Canadian Factory: Kitchener, Ont.

World-Wide Sales and Service



"Weather-Proofed"

AGAINST RAIN, SLEET, SUB-ZERO TEMPERATURES AND HIGH WINDS!

WEATHER-PROOFED Allis-Chalmers switchgear performs dependably in rain, sleet, sub-zero temperatures and high winds. Weather-proof construction provides protection in any weather...any atmosphere.

Here's why: (1) welded-in floor plates form tight bottom seal; (2) overhanging eaves keep out driving rain and sleet and protect vital switching equipment; (3) front and rear weather-proof door are held closed at three points; (4) rust resistant phosphate treated steel panels, multi-coated with weather tested paint, complete the top-to-bottom weather barrier; (5) ice and sleet shields protect locks.

Contact your local A-C sales representative for further information or write direct.

A 2916

Allis-Chalmers
Milwaukee 1, Wis.

. . . PLUS OTHER ADVANTAGES

Protected Ventilation

Copper mesh filters behind louvre openings bar the entry of dust, dirt, insects, etc. They allow air to circulate and cool the switchgear interior. Space heaters prohibit moisture condensation, a frequent cause of insulation failure.

Full Length Instrument Panel

Provides more space for meters, relays, instruments. Panel swings out so you can readily reach secondary wiring. Provides protection, too. This design is adaptable to a variety of circuit arrangements.

Safer Than Ever Before

Bolted-on steel barriers completely isolate circuit breaker, current transformer, disconnect switch, lightning arresters, drawout potential and control transformer, and other equipment compartments.

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INTERSTATE POWER CO.
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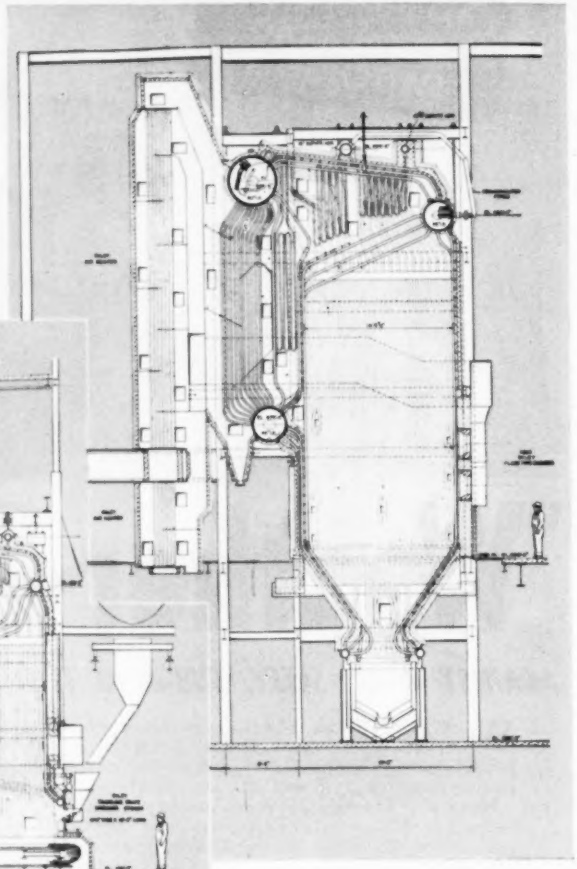
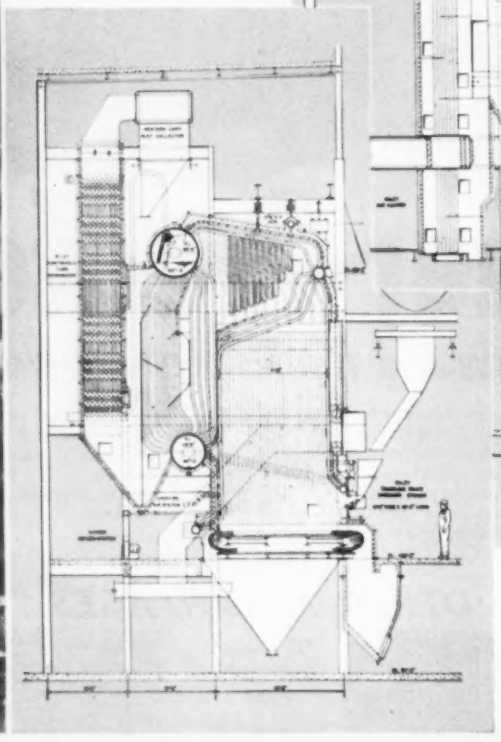
2—120,000 lbs./hr. Riley Units
Steam Pressure—975 lbs.
Steam Temperature—910°F.
Pulverized Coal Fired

Interstate Power Company also has Riley Units in their plants at Clinton and Dubuque, Iowa and Shelbourne Falls, Minn.





IOWA-ILLINOIS GAS & ELECTRIC CO.
IOWA CITY, IOWA

2—60,000 lbs./hr. Riley Units
Steam Pressure—500 lbs.
Steam Temperature—740°F.

Fired by Riley Traveling Grate Spreader Stokers

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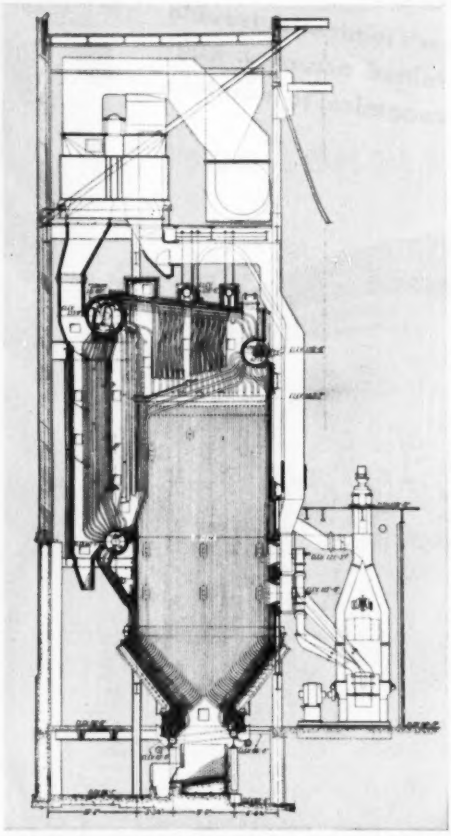
out where the corn grows tall

By far the big majority of recent large boiler installations in the state of Iowa have been Riley Steam Generating Units



IOWA-ILLINOIS GAS & ELECTRIC CO., DAVENPORT, IOWA

3—250,000 lbs./hr. Riley Units
Steam Pressure—1000 lbs.
Steam Temperature—850°F.
Fired by Pulverized Coal

Iowa-Illinois Gas & Electric also has Riley Units in their Moline, Ill. and Iowa City, Iowa plants.

All of these Iowa companies have Selected Riley Units in recent years

IOWA ELECTRIC LIGHT & POWER CO.
Marshalltown, Iowa
325,000 lbs./hr. 975 lbs. 910°F.

IOWA ELECTRIC LIGHT & POWER CO.
Boone, Iowa
300,000 lbs./hr. 775 lbs. 835°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
Davenport, Iowa
3—250,000 lbs./hr. 1000 lbs. 850°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
Moline, Ill.
2—200,000 lbs./hr. 925 lbs. 825°F.

IOWA-ILLINOIS GAS & ELECTRIC CO.
Iowa City, Iowa
60,000 lbs./hr. 500 lbs. 740°F.

INTERSTATE POWER CO.
Lansing, Iowa
2—120,000 lbs./hr. 975 lbs. 910°F.

INTERSTATE POWER CO.
Dubuque, Iowa
200,000 lbs./hr. 725 lbs. 910°F.

INTERSTATE POWER CO.
Shelbourne Falls, Minn.
2—120,000 lbs./hr. 700 lbs. 910°F.

INTERSTATE POWER CO.
Clinton, Iowa
45,000 lbs./hr. 450 lbs. 465°F.

IOWA PUBLIC SERVICE CO.
Carroll, Iowa
2—60,000 lbs./hr. 475 lbs. 750°F.

CORN BELT POWER CO-OP.
Humboldt, Iowa
125,000 lbs./hr. 700 lbs. 825°F.

CORN BELT POWER CO-OP.
Humboldt, Iowa
165,000 lbs./hr. 1000 lbs. 915°F.

RATH PACKING CO.
Waterloo, Iowa
125,000 lbs./hr. 450 lbs. 675°F.

IOWA STATE COLLEGE
Ames, Iowa
100,000 lbs./hr. 275 lbs. 506°F.

IOWA STATE COLLEGE
Ames, Iowa
80,000 lbs./hr. 260 lbs. 423°F.

CITY OF AMES, IOWA
95,000 lbs./hr. 700 lbs. 830°F.

The majority of the above installations are pulverized coal fired. Some are fired by Riley Traveling Grate Spreader Stokers and others by Riley Traveling Grate Stokers. We believe no other boiler company can point to such a large number of boiler sales in Iowa during the past few years.

A survey of your Power Plant by a consulting engineer will possibly show ways of making surprisingly large savings in your power costs

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. . . it will pay you to visit modern Riley Installations before purchasing Boiler or Fuel Burning Equipment

ECONOMIZERS • WATER-COOLED FURNACES • STEEL-CLAD INSULATED SETTINGS • AIR HEATERS

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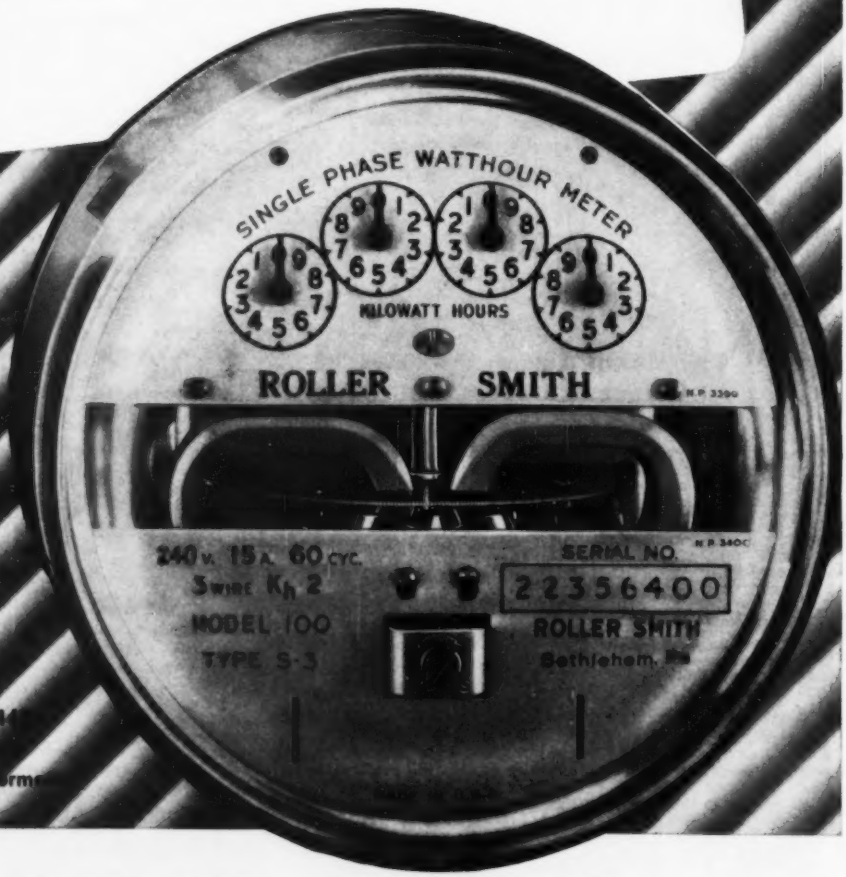
meet today's requirements . . . tomorrow's loads with trouble free performance, long life and sustained accuracy. Rugged and simple in design, easy and economical to maintain. Give them a trial on your system.



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INSTRUMENTS • RELAYS • SWITCHES • CIRCUIT BREAKERS • POWER SWITCHING EQUIPMENT • SWITCHGEAR

FOR LONGEST BATTERY SERVICE,

TEMPERATURE READINGS ARE VITAL!

Specific gravity readings, unless corrected for the temperature of the electrolyte at the time they are taken, do not always give a true indication of battery condition. How to make these corrections is explained briefly below. More complete information on this important subject is contained in the vast library of technical information—covering every phase of battery care—available to you free, without obligation, with the GOULD PLUS-PERFORMANCE PLAN. Use this Plan consistently and you can improve your battery performance as much as 50%! Send for this free booklet describing the Plan in detail.

HOW TO CORRECT SP. GR. READINGS FOR TEMPERATURE

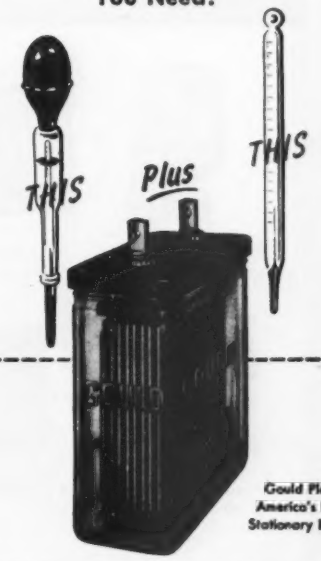
For a true picture of battery condition, each specific gravity reading must be corrected in accordance with the temperature of the electrolyte at the time the reading is taken.

To make such a correction, add one point (.001) in specific gravity to the actual hydrometer reading for each 3° F. in electrolyte temperature above 77° F.; and subtract one point (.001) in specific gravity from the actual hydrometer reading for each 3° F. below 77° F.

EXAMPLE:

HYDROMETER READING	CELL TEMPERATURE	CORRECTION	READING CORRECTED TO 77° F.
1.213 Sp. Gr.	68° F.	−.003 points	= 1.210 Sp. Gr.
1.207 Sp. Gr.	86° F.	+.003 points	= 1.210 Sp. Gr.
1.204 Sp. Gr.	95° F.	+.006 points	= 1.210 Sp. Gr.

For Correct Specific Gravity Reading You Need:



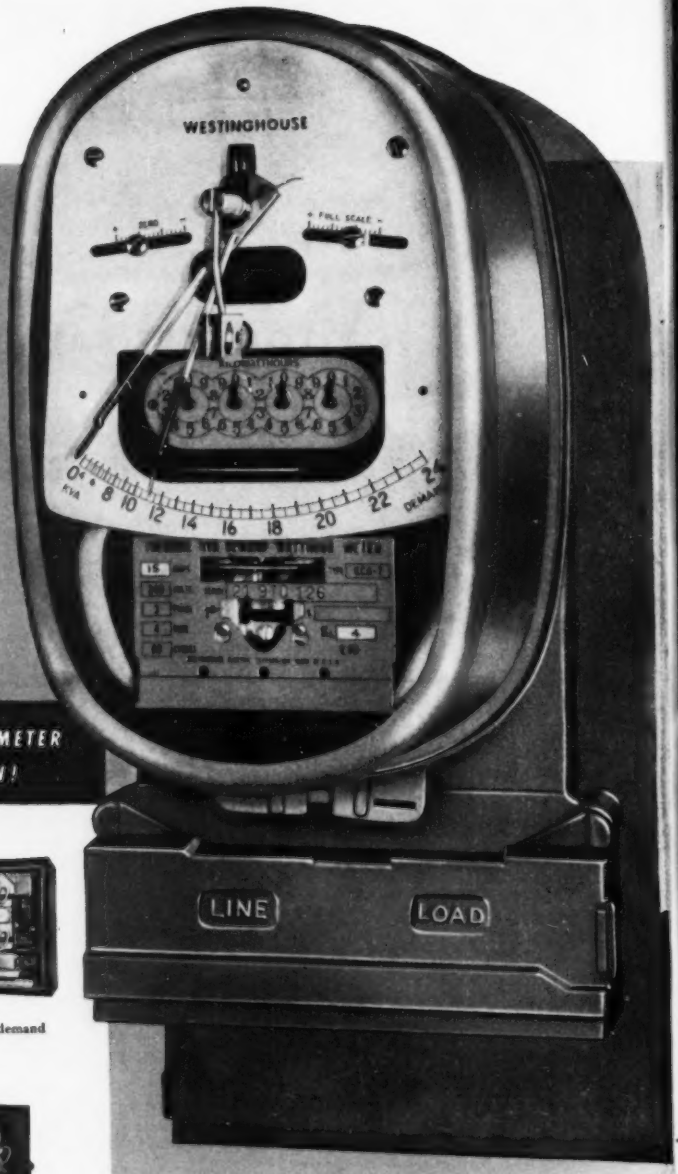
Gould Plante America's Finest Stationary Battery

GOULD **STORAGE BATTERIES**

GOULD-NATIONAL BATTERIES, INC., TRENTON 7, NEW JERSEY

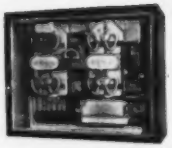
Always Use Gould-National Automobile and Truck Batteries

The new KCA combination watthour and thermal kva demand meter is available in five types for a variety of circuit applications. It's the first polyphase combination watthour and thermal kva demand meter on the market.



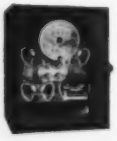
THERE'S A WESTINGHOUSE METER FOR EVERY APPLICATION!

Polyphase thermal kva demand meters.



Recording kva demand meters.

Totalizing kva recording demand meters.



Kva indicating demand meters.

NEW Combination Polyphase Thermal kva Demand Meter

Cuts KVA Metering Costs!

Here's another Westinghouse "first" that answers a metering problem by helping you to attain low-cost kva demand metering. It's the new KCA Meter which combines a simple, practical method of measuring kva demand, with low maintenance cost. And it joins a large family of cost-savers because only Westinghouse offers you . . .

A complete line of kva demand equipment . . . one that meets all of your present needs and anticipates many of your future requirements!

Illustrated here are some representative examples of the diversified equipment Westinghouse offers for this important application. This is the equipment you need for accurate kva demand measurement of any power loads.

In the complete line of Westinghouse metering equipment you'll spot many opportunities for savings. So whatever your metering needs, call on Westinghouse.

For complete information on the new KCA meter write for Catalog Section 42-340. Address: Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-40395

SIMPLEX-ANHYDREX CABLES STAY ON THE JOB IN WET LOCATIONS

Here's Proof

IN TEST FIGURES

Continuous testing to rigid standards proves without doubt that Anhydrex insulation will not absorb more than 20 mg. of water per square inch of exposed surface. Rarely does the figure climb that high. After one day's immersion in water at 70°C. (158°F.) Anhydrex has a dielectric constant that will not exceed 3.2. Its increase in capacitance between one and eight days' immersion at 70°C. will not exceed 3.5% for insulation thicknesses greater than 4/64", or 5% for thicknesses of 4/64" and less.

IN SERVICE RECORDS

Reports from the field, which indicate that no ANHYDREX Cable has ever failed due to water absorption, include this account: An eastern city known for its bad water conditions installed nearly 10,000 ft. of ANHYDREX Cable in its municipal signal and communications systems. During ten years' service the cables had no trouble whatsoever, although ducts and manholes there are nearly always full of water and metallic cables used in the same installations had proved inadequate. ANHYDREX Cable that was buried directly in the ground came through with the same trouble-free service, and portions of cables exposed above earth suffered no deterioration.

Neoprene-jacketed ANHYDREX Cables need no additional coverings. They cut down weight, diameter and cost. You can use them underground, overhead, or in ducts without fear of water and moisture, soil acids and alkalies and weathering. Specify them with confidence for transmission and distribution systems, signal and communication circuits, street, airport and park lighting.

SIMPLEX ANHYDREX

SIMPLEX WIRE & CABLE CO 79 SIDNEY ST CAMBRIDGE 39 MASS

Here's a line of aluminum suspension and strain clamps that was designed from the start solely for use with aluminum conductors. The new Locke WATTSAVER design gives you all the loss-saving advantages of conventional aluminum clamps PLUS these exclusive features.

ALUMINUM KEEPERS (not ferrous) FOR GREATEST SAVINGS Aluminum clamps with *aluminum* keepers have just *half the magnetic losses* of aluminum clamps with *conventional ferrous* keepers. What's more, with aluminum keepers no lining is required . . . and corrosion resistance is much greater.

HEAVIER SECTIONS GIVE YOU HIGHER SAFETY FACTOR Larger, heavier sections in the design of Locke WATTSAVER clamps (see photograph) mean greater margins of safety in mechanical strength. And the fact that Locke WATTSAVER clamps are designed solely for use with aluminum conductors means a better conductor fit with either conventional or preformed rods.

YOU GET HIGHEST SLIP STRENGTHS Aluminum bodies with aluminum keepers possess greater coefficient of friction with aluminum conductors—an advantage of major importance.

A COMPLETE LINE OF LOCKE WATTSAVER CLAMPS This new Locke line of Aluminum Clamps is broad enough to provide you with the proper clamp for every size of aluminum conductor, bare or armored, within the "5 to 15" rule. Try them by specifying them next time you need aluminum clamps.

This 16-page technical bulletin on Locke WATTSAVER Clamps is yours for the asking. Gives you the complete factual story why you're the winner when you specify Locke Wattsaver Clamps for your lines. Send for your free copy today.

LOCKE

LOCKE DEPARTMENT
GENERAL ELECTRIC COMPANY
BALTIMORE, MARYLAND

ALLIS-CHALMERS
INSTRUMENT TRANSFORMER

Accuracy Pays Off!
TWO WAYS

1 Assures correctness of customer's power bill

2 Helps determine power supplier's income

AS A METERING SUPERINTENDENT or purchaser of instrument transformers, you know the full importance of high quality equipment in power metering. You know, for example, that large errors in watthour and demand meter records could result from just a small error in your instrument transformer.

Accuracy in instrument transformers pays off for both the user and the supplier since it determines: (1) the amount of power for which your customer is billed, (2) the income to the supplier for that service.

ACCURACY MEETS ASA STANDARDS

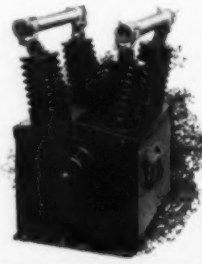
You get *accurate* metering with any Allis-Chalmers current or potential transformer or metering outfit. Each one is designed and built to meet ASA standards . . . and has the best combination of engineering and materials that 50 years of experience can provide.

New developments and technical improvements are being applied to many Allis-Chalmers instrument transformers. The new Type SPW potential transformer, for example, is smaller, lighter and more compact. As a step toward longer life, the coils are corona-protected. The hermetically sealed, all-welded tank protects insulation and oil from sludge formation.

Contact your nearby Allis-Chalmers district office for details on any instrument transformer in this wide line. Or write Allis-Chalmers, Milwaukee 1, Wisconsin for bulletin 61B7168. A-3629

Outdoor potential transformer for heavy duty metering service, Type SPW. Ratings up to 69 kv. Compact, lightweight design. Also available in single bushing design for line to ground connection.

Outdoor current transformer for heavy duty metering, Type KO. Ratings up to 15 kv and 800 amperes. Solid compound guards windings and insulation from air and moisture. Mounts in any position, horizontally or vertically.

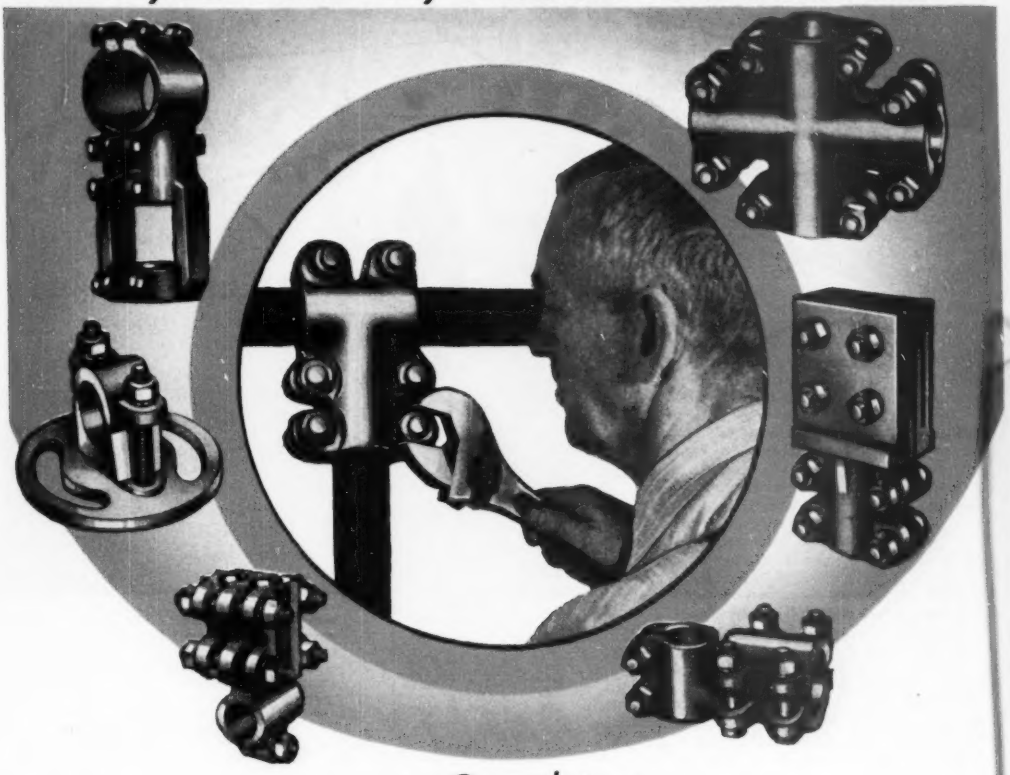


Indoor potential transformer, 500 va fused or unfused, Type PD. Ratings up to 14,400 volts. High thermal capacity. Compound filled under vacuum . . . eliminates air and moisture and extends insulation life.

ALLIS-CHALMERS

A-C ALLIS-CHALMERS

When you need any **POWER CONNECTOR—**



see the Complete line

Probably the exact Power Connector you want is one of the standard Penn-Union items. You will find Tee and Stud Connectors and Solderless Terminal Adapters, Bus Supports, Terminals, Elbows, Cross Connectors, Couplers, Reducers—each in a wide range of sizes, up to the largest.

Also the **complete** line of Service Connectors, Cable Taps, Straight and Parallel Connectors, Grounding Clamps—every good type of conductor fitting. Penn-Union connectors are the first choice of experienced users, because of their **known dependability**, mechanically and electrically.

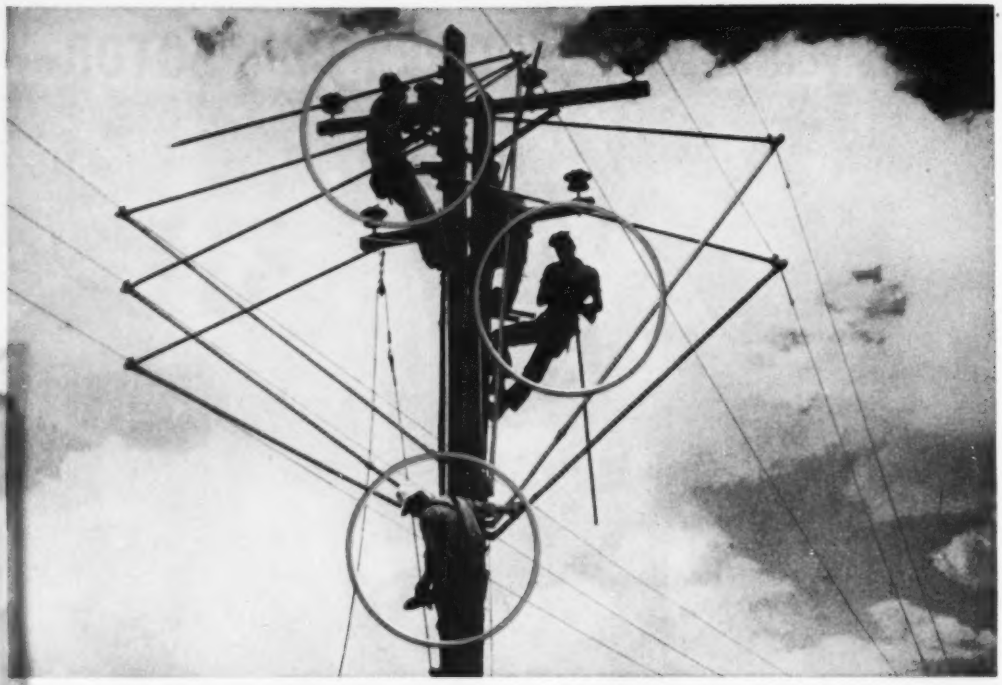
Sold by Leading Wholesalers

PENN-UNION ELECTRIC CORPORATION, Erie, Pa.

Canada: Dominion Cutout Company, Ltd.
250 Richmond St. West, Toronto

THE *Complete* LINE OF CONDUCTOR FITTINGS

PENN-UNION



Their Lives Depend on the SAFETY of Their Tools...

There's nothing more important to hot stick crews than the safety of the tools they use. It's also important to safety directors, maintenance supervisors and, of course, to management that these tools be absolutely safe, that they are properly cared for and carefully inspected at periodic intervals.

Plastic coatings have helped to make hot sticks safer by protecting them from external damage. Now, a new tough transparent plastic protection called Chance "Maplac" also makes it possible to check the condition of the wood by visual inspection.

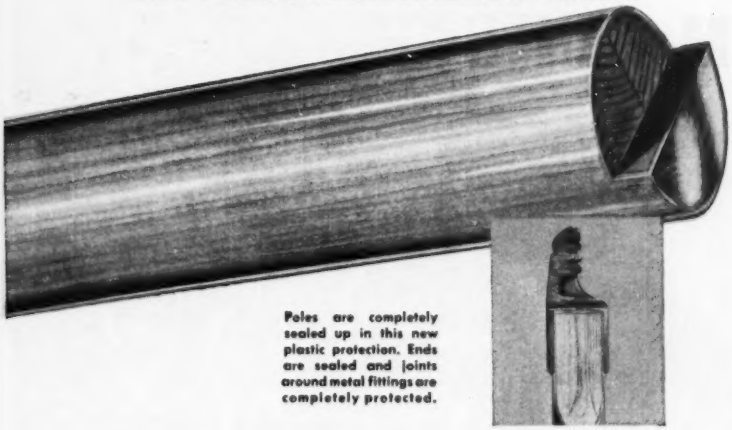
Chance "Maplac" Protected Tools are the result of more than five years of painstaking research. This brand-new coating process, developed jointly by Chance engineers and our plastic supplier, provides a crystal clear, extremely tough finish that resists surface abrasion; is unaffected by oil, grease, gasoline or salt water; that perfectly seals joints around metal fittings; that retains its toughness regardless of temperature variations and that can be readily repaired without tools or heat should the coating be cut by a sharp blow.

Chance "Maplac" protection fully meets the long established Chance standards for excellence in performance and safety to linemen. "There's nothing too good where life is at stake."

NOW... Plastic Protection at No Extra Cost!

CHANCE MAPLAC* Plastic Protected HOT LINE TOOLS

cut tool maintenance costs!



Poles are completely sealed up in this new plastic protection. Ends are sealed and joints around metal fittings are completely protected.

Now, Chance lightweight, aluminum-fitted Hot Line Tools are protected with a new super-tough plastic finish called "Maplac"* that greatly reduces tool maintenance and helps to keep tools in safe working condition.

This new plastic protection has many plus features of real value to hot stick users:

TOUGHNESS to withstand any impact or abrasive action encountered in normal use.

TRANSPARENCY that permits initial inspection and periodic checks.

MECHANICAL STRENGTH–Chance "Maplac," being extremely tough, does not require sacrifice of pole size and strength to gain the necessary thickness. It adheres to the wood surface and reinforces the pole adding to the factor of safety.

TEMPERATURE RESISTANCE–retains its toughness under widely varying temperatures.

ELECTRICAL RESISTIVITY– exceeds the voltage withstand tests of the wood insulation (complete safety, however, depends on the moisture content of the wood–no plastic will completely prevent absorption of moisture vapor).

MOISTURE RESISTANCE–Chance "Maplac" retards the absorption of atmospheric vapor in high humidity and protects the wood from precipitation moisture (this does not mean that plastic covered poles are recommended for use in the rain–but that Chance "Maplac" greatly reduces moisture penetration.

REPAIRABILITY–may be repaired without heat or special tools if cut by a sharp blow.

All this at NO INCREASE IN PRICE! Specify Chance "Maplac" Plastic Protected Tools.

* TRADE NAME

A·B·CHANCE CO.
CENTRALIA, MISSOURI
SAN FRANCISCO, CALIF.

Reprinted from "CHANCE TIPS"

Using hot sticks for the last thirteen years in forty-eight states and five Provinces of Canada has shown me the need for some good tough covering for these tools. We demonstrators try to set a good example in caring for tools by the way we handle them in use. We also carry them in trailers where we can take better care of them than you can by hauling them in bags or thrown loose on trucks. Even with the care we give them, it's almost impossible to keep from scarring these important tools in use or in hauling and storing them. We have to have our hot sticks refinished twice a year. This costs money even if it is a rainy day job with many of you.

About five years ago, I began putting the bite on our Research Department for something better. Since plastics were used in everything from toys to heavy machinery, we figured some type could be used on hot sticks. After a lot of arguments, experiments, tests and headaches, they now have me thoroughly convinced that "Maplac" is the answer.

I don't know what the stuff is, but it's tough, strong, light and looks good. It's clear as cellophane so you can see the grain of the wood and inspect the pole right through the plastic.

This Chance "Maplac" coating doesn't mean that hot sticks can now be thrown around in the truck or on the ground like a shovel or sledge hammer. They're tough but you still have to watch out for surface dirt or moisture.

Chance "Maplac," like any other plastic, will absorb moisture but this action is much slower on a "Maplac" covered pole than on the old-type stick treated with pole preservative. By the same token, it also takes longer to dry out the new pole. Our Engineering Department tells me there is nothing—even glass—that moisture won't eventually penetrate.

The biggest advantage of Chance "Maplac" protected tools is the saving in stick maintenance. Take the same care of these new sticks that you took with the old and your hot stick maintenance will come way down. Also you'll have sticks that always look good—sticks that men will be proud to use.

SEND FOR A SAMPLE

If you would like to inspect this new plastic protection, send us a postcard, or attach the coupon below to your letterhead.

A. B. CHANCE COMPANY, Centralia, Mo.
Please send a sample of your new plastic protection.

Name_____
Title_____
Company_____
Address_____
City_____ State_____

Meeting a tight

New York's largest

STEAM GENERATOR

a 1,450,000 lb per hr FOSTER WHEELER

New York is perennially "bursting at the seams"—but there is always a way to accommodate additional development. This is made possible by wise city planning and the far-sighted policy of the Consolidated Edison Company of New York, Inc. which keeps ahead of New York's ever-growing demand for electricity. The new Foster Wheeler Steam Generator now being constructed for the East River Station of the Consolidated Edison Company is a contemporary example of how one organization seeks to anticipate the needs of future populations.

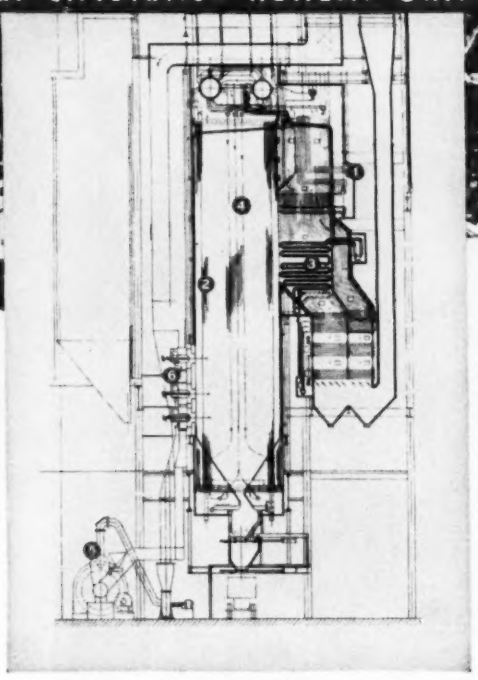
FOSTER WHEELER CORPORATION • 165

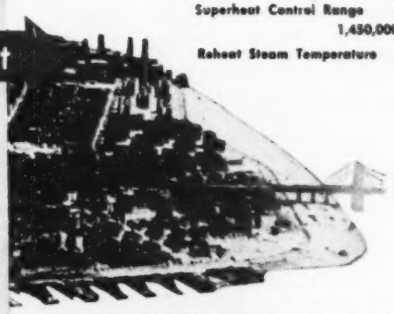
situation

New FW Steam Generator for the East River Station of the Consolidated Edison Company of New York, Inc.

Maximum Capability	1,450,000 lb per hr
Pressure Superheater Outlet	1850 psig
Primary Steam Temperature	1000 F
Superheat Control Range	325,000 to 1,450,000 lb per hr
Reheat Steam Temperature	1000 F

Dual Circulation REHEAT Unit





1. **STEAM OF SUPER PURITY**—Application of dual circulation principle produces steam of lowest contamination especially silica.
2. **RADIANT SUPERHEATER**—in combination with convection superheater enables attainment of full primary steam temperature from 25% to full load.
3. **CONVECTION REHEATER**—Location in low temperature zone after convection superheater provides protection against all variables in operation.
4. **CONSERVATIVE FURNACE**—Low heat absorption rates per unit area and low furnace exit gas temperatures.
5. **FOSTER WHEELER BALL MILLS**—High availability, low maintenance and sustained fineness of pulverization.
6. **FOSTER WHEELER TURBULENT BURNERS**—Turbulent action of air and fuel produces uniform mixture for complete combustion and even heat distribution.

BROADWAY, NEW YORK 6, N. Y.

FOSTER WHEELER

NEW *a-c operated* megohmmeter

⅓ to 2,000,000 megohms *with Constant 500 Volts Across Unknown*

RUGGED ☆ PORTABLE ☆ ACCURATE ☆ SIMPLE TO USE

SIMPLE TO USE — *Minimum of panel controls for inexperienced personnel . . . value of unknown is product of meter reading and multiplier switch setting*

SAFE TO USE — *In the DISCHARGE position of panel switch all voltage is removed from terminals, allowing connections to be made or broken with complete safety*

CONSTANT 500-VOLTS APPLIED TO UNKNOWN — *the standardized voltage level for these measurements — balanced vacuum-tube voltmeter indicating circuit with glow-discharge type of voltage regulator tube and stabilized 500-volt supply — voltage on unknown is held at 500 to within ± 2% over a 105- to 125-volt supply line range*

RAPID MEASUREMENTS OF CAPACITOR LEAKAGE — *in the DISCHARGE switch position a shunt resistor is automatically connected across the UNKNOWN terminals, removing any residual charge in capacitive component of the unknown . . . this feature is especially useful when measuring leakage resistance of capacitors*

NOT NECESSARY TO CHARGE UNKNOWN *before starting measurements, as circuit resistance is so small that it has negligible effect on charging time of even largest capacitors*

VERY CONVENIENT IN OBSERVING APPARENT LEAKAGE RESISTANCE *after one and ten minutes of charging time, as is done commonly as routine checks on large electrical machines*

"CHECK" SWITCH POSITION PROVIDED *for checking calibration . . . controls provided for readjustment, normally required only when tubes are changed*

GUARD AND GROUNDING TERMINALS *provided, in addition to the two unknown binding posts, for making three-terminal resistance measurements . . . ground terminal can be connected either to guard terminal or to one of the UNKNOWN terminals*

ACCESSORIES SUPPLIED — *Two color-coded test leads with phone tips, two insulated probes, two alligator clips and a G-R Type 274-MB Plug*

For General-Purpose Resistance Measurements

☆ *in Production*

☆ *in the Repair Shop*

☆ *in the Field*

For Insulation Resistance Tests

on Transformers ☆ Capacitors

Cables ☆ Rotating Electrical Machines

☆ *Household Appliances*

Type 1862-A Megohmmeter: $225.

GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Mass.

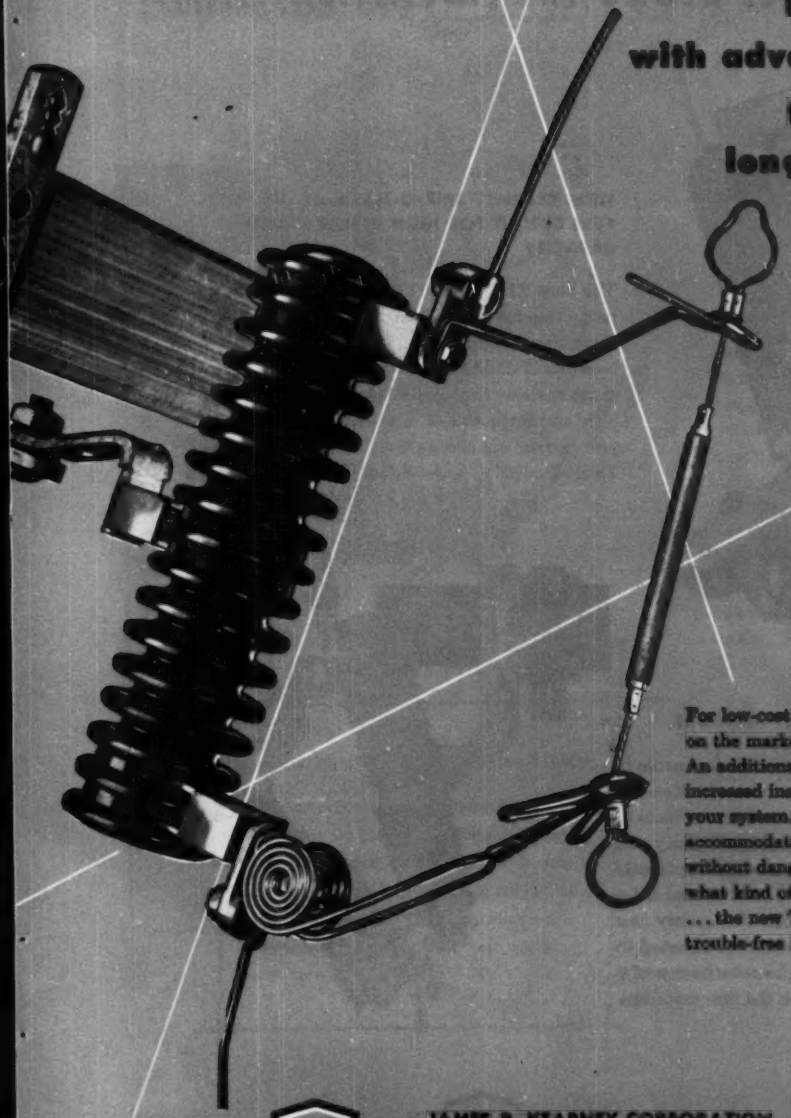
at West Street NEW YORK 6 · 920 S. Michigan Ave. CHICAGO 5 · 1000 N. Seward St. LOS ANGELES 38

here is the *NEW* improved

KEARNEY TRIP-O-LINK

FUSE CUTOUT

with advanced *design* features that assure longer service life

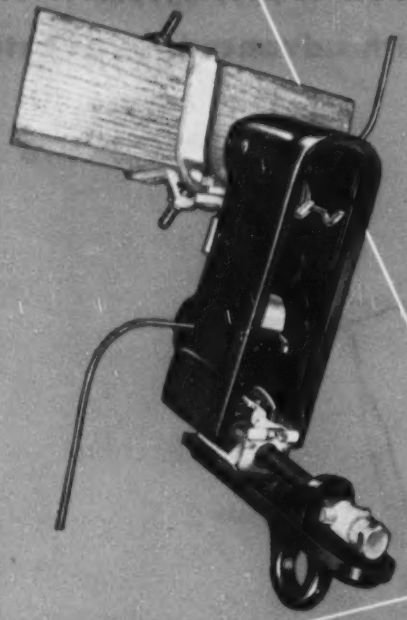


For low-cost protection there is no finer cutout on the market than the new TRIP-O-LINK. An additional petticoat gives you greatly increased insulation . . . increased protection for your system. The new TRIP-O-LINK will accommodate either copper or aluminum wire without danger of galvanic action. No matter what kind of conductor is available in the future . . . the new TRIP-O-LINK is ready for trouble-free installation.

Turn the page for additional information on Kearney Cutouts

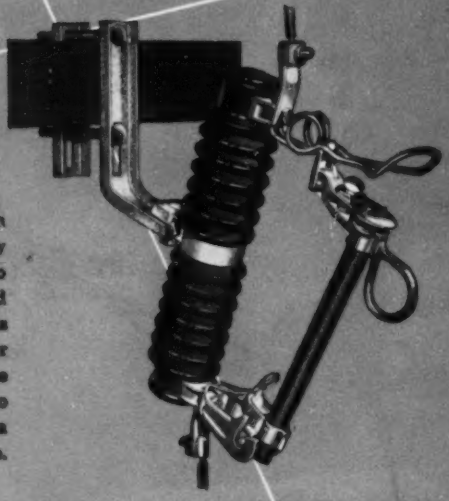
JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo.
Canadian Plant — Guelph, Ontario

YOU GET
POSITIVE PROTECTION
ALL ALONG THE LINE



NEW KEARNEY TRIP-O-MATIC HEAVY DUTY FUSE CUTOUT FOR HIGH INTERRUPTING CAPACITY

The New TRIP-O-MATIC provides dependable protection for heavily loaded lines subject to high short circuit currents. All critical parts in the New TRIP-O-MATIC have been heavied up to stand the electrical and mechanical impact of high amperage surges. You can count on year in-year out service from the New Kearney TRIP-O-MATIC under full-rated load conditions.

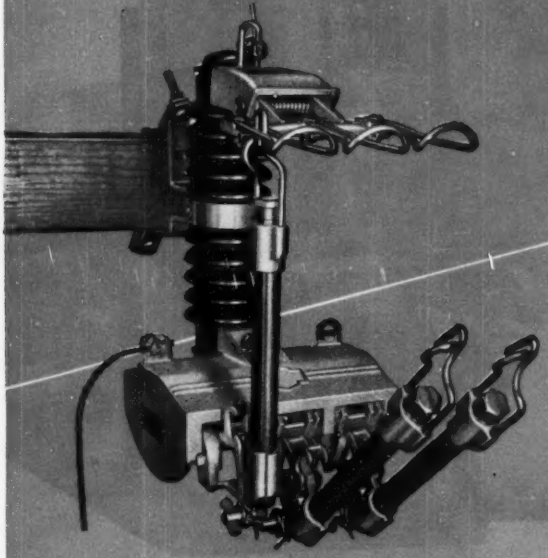


THE KEARNEY TRIP-OUT

The very latest developments in cutout construction are found in the Kearney TRIP-OUT. With silver-to-silver contacts to preserve current-carrying efficiency and accommodate heavier loads, this unit represents the best open-type cutout available for heavy current faults. As with all Kearney fuse cutouts, the TRIP-OUT can be converted to a disconnect switch by the substitution of a disconnect blade for the fuse cartridge.

JAMES B. KEARNEY CORPORATION ST. LOUIS, MO.

...WHEN YOU USE KEARNEY FUSE CUTOUTS



THE KEARNEY TRIP SAVER

The Kearney TRIP SAVER will eliminate many costly service trips. Perfect coordination with other fuse cutouts permits maximum sectionalizing, thus reducing the extent of an outage. Wherever higher rupturing capacity, perfect fuse-to-fuse coordination, or lower service expense is required specify the Kearney TRIP SAVER. For complete details of the continuous operating sequence, write for catalog page 1-48.

BE SURE TO USE KEARNEY FUSE LINKS

Good cutout performance depends a great deal upon the fuse link used. Kearney provides the widest possible choice in fast, medium or slow fuse links for use on all modern cutouts. So for maximum protective performance specify Kearney on your next fuse link order.

JAMES R. KEARNEY CORPORATION ST. LOUIS, MO.

JAMES R. KEARNEY CORPORATION
4224-42 Clayton Avenue, St. Louis 10, Mo.
Canadian Plant — Guelph, Ontario

KEARNEY *Gives a Little More for a Little Less* *Through Engineering*

What kind of men?

What kind of men are the 2500 scientists and engineers of Bell Telephone Laboratories?

They are men of many types, yet they work well together, for all have good minds as a foundation, years of study in the fundamentals of their science and in the methods of research and design. Vital, too, is their teamwork — for without the co-operation of many individuals the products of research and development could never be perfected.

Above all else these men have "the spirit to adventure, the wit to question, and the wisdom to accept and use."

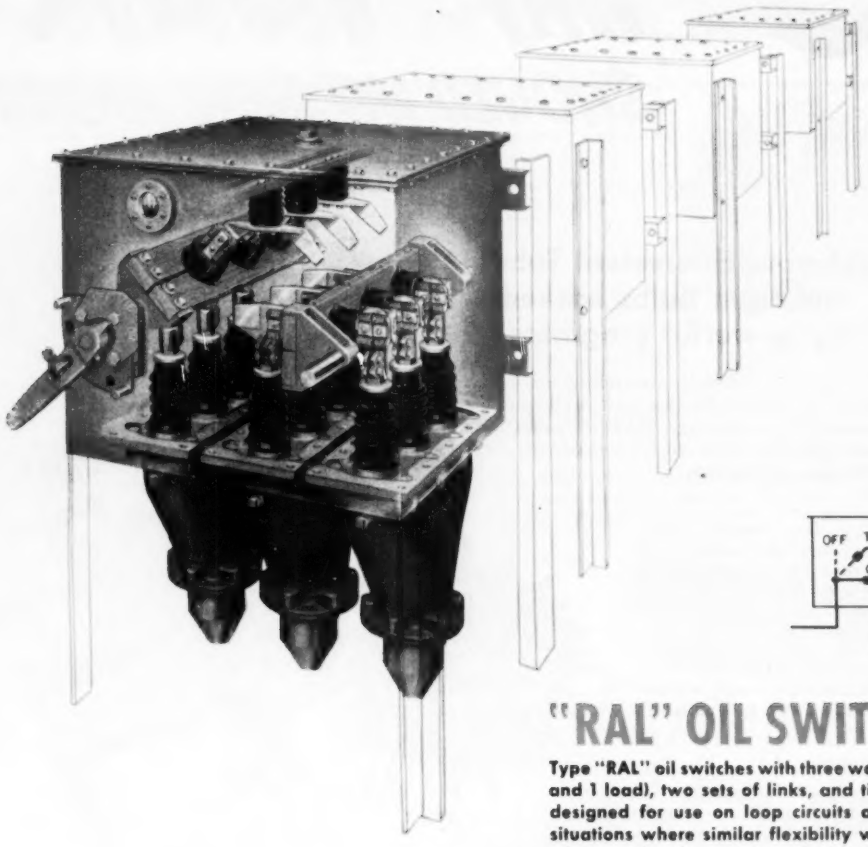
Such men can develop the world's finest telephone systems — and have done so.

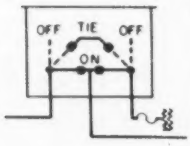
Perhaps there is a place among them for you. Write the Employment Director, Bell Telephone Laboratories, New York 14.

BELL TELEPHONE LABORATORIES

• EXPLORING AND INVENTING, DEVISING AND PERFECTING FOR CONTINUED IMPROVEMENTS AND ECONOMIES IN TELEPHONE SERVICE

PROVIDE SAFE SECTIONALIZATION FOR CABLE SYSTEM FLEXIBILITY WITH G & W LOAD BREAK OIL SWITCHES





"RAL" OIL SWITCHES

Type "RAL" oil switches with three ways (2 feeder and 1 load), two sets of links, and tie buses are designed for use on loop circuits and in other situations where similar flexibility would otherwise require three separate oil switches with correspondingly greater expense for equipment, installation, and space.

These oil switches materially reduce the length of time required for restoring service in case of trouble, or for isolating a circuit to make changes. Load break disconnection of a circuit is accomplished by manually operating an external lever —without opening the tank or breaking the oil and moisture seals.

Bulletin DB51 gives complete data and prices. Write for your copy or ask your representative.

G & W "Forethought" DB-20 shows how "RAL" switches are combined with power fuses. Send for your copy, there is no obligation.

G & W ELECTRIC SPECIALTY CO.

7780 Dante Avenue, Chicago 19, Illinois

Cable Terminating, Connecting and Sectionalizing Devices

Representatives in principal cities of U. S. A.

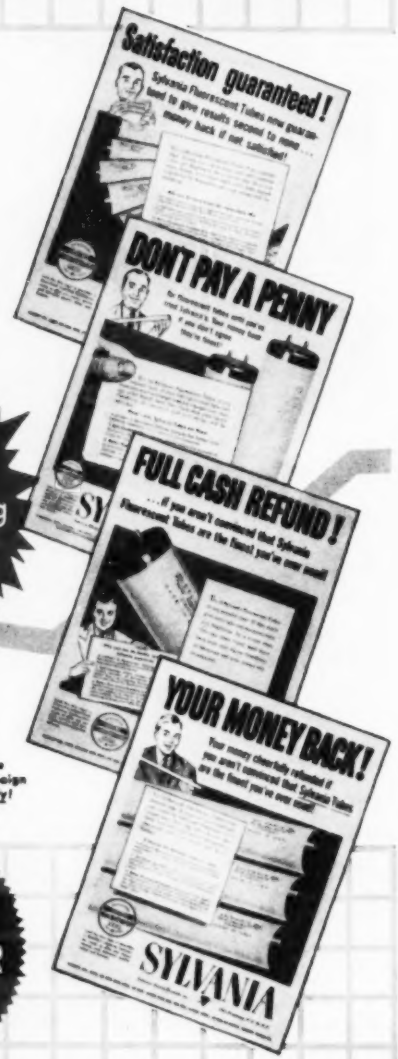
In Canada—Powerlite Devices, Ltd., Toronto and Montreal

3 REASONS WHY YOUR SHOULD HIT NEW HIGHS

Sylvania Fluorescent Tubes and Light Bulbs backed by powerful programs

The story of Sylvania's outstanding quality has caught on everywhere. And now, we're pushing that advantage with bigger-than-ever, nation-wide campaigns to build record Sylvania sales for every wholesaler and retailer.

Ads in *Time*, *Business Week*, *Newsweek*, and other important magazines are pounding home the superiority of Sylvania Fluorescent Tubes with a challenging, money-back guarantee. In addition, full pages in *The Saturday Evening Post*, *This Week*, and *American Weekly* will sell Sylvania Products to millions.

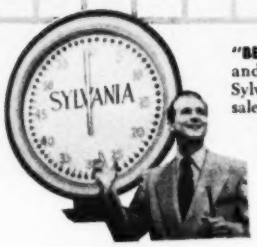


1 Big Smashing National Ads

Urge all Contractors to join the Qualified Lighting Contractor campaign and display this sign *prominently*!

LIGHTING CONTRACTOR

SYLVANIA SALES THIS SPRING!



"BEAT THE CLOCK" . . . featuring Roxanne and Bud Collyer will continue to win Sylvania Customers . . . build bigger Sylvania sales records.

3 Fascinating Unique, Premium Offer

THE MAGIC WINDOW WASHER . . . is a work-saver that women really go for. Nationally advertised in Good Housekeeping, this premium assures extra light-bulb sales without extra effort

2 The Weekly CBS-TV Programs

COLORFUL, "POINT-OF-SALE" MATERIAL TOO . . . plenty of it! Below are bright posters and streamers . . . FREE with every Sylvania order to keep Sylvania Light Bulbs moving FAST!

Only **25¢** and the end of a Sylvania 4-Pack

FOR THE BEST fluorescent tube and light bulb business you have ever known, be sure to cooperate with Sylvania NOW! For full details about how and why, write today to: Sylvania Electric Products Inc., Dept. L-3003, 1740 Broadway, New York 19, N. Y.

SYLVANIA

FLUORESCENT TUBES, SIGN TUBING, FIXTURES, WIRING DEVICES; LIGHT BULBS; RADIO TUBES; TELEVISION PICTURE TUBES; ELECTRONIC PRODUCTS; ELECTRONIC TEST EQUIPMENT; PHOTOLAMPS; TELEVISION SETS

PROBLEM:

Industrial Contamination

LAPP LINE POST

"All-time champion" among transmission insulators in point of service dependability at duty up to 69 kv. Its record, both on new construction and after reinsulation of lines to higher voltages, has been built on ability of Line Post to avoid leakage flashover, to withstand lightning arcover and mechanical attack, its inherent freedom from puncture and cracking.

LAPP STATION POST

In addition to the superior electrical and mechanical characteristics inherent in Lapp Post design, Station Posts also possess extra rigidity. Cap and base are externally attached for large-area low-intensity compression loading of porcelain, as contrasted to small-area, high-intensity loading of nested porcelain and metal parts in conventional pin-cap switch insulators.

LAPP FOG-TYPE SUSPENSION INSULATOR

For high-voltage lines in areas of severe contamination—salt fog, industrial fumes, or dust—Lapp Fog-Type suspension units provide maximum leakage distance per length of string—and for greater effectiveness of leakage distance, inch for inch.

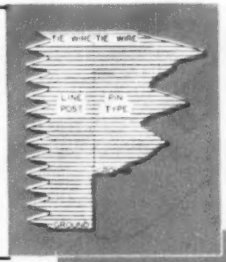
SOLUTION:

Lapp Fog-Type Design

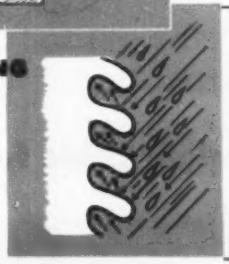
Service dependability on lines subjected to severe contamination . . . industrial smoke and fumes, dust, or salt fog . . . can be assured—without frequent cleaning of insulators—and without danger of failure from leakage flashover. Lapp Fog-Type design provides superior performance for transmission, switch and bus support because of two basic superiorities of design principle . . .

1. UNIFORM LEAKAGE PATH

Leakage flashover results from a contaminated surface which is not uniform—wet areas lower total resistance, so increase leakage current until voltage flashes over narrow shielded areas, precipitating flashover of entire unit. Compare developed uniform leakage surfaces of 66 kv Line Post (on left side) with that of conventional pin-type (right) where variation in conductivity is 3.6 times as great.



2. SELF-CLEANING

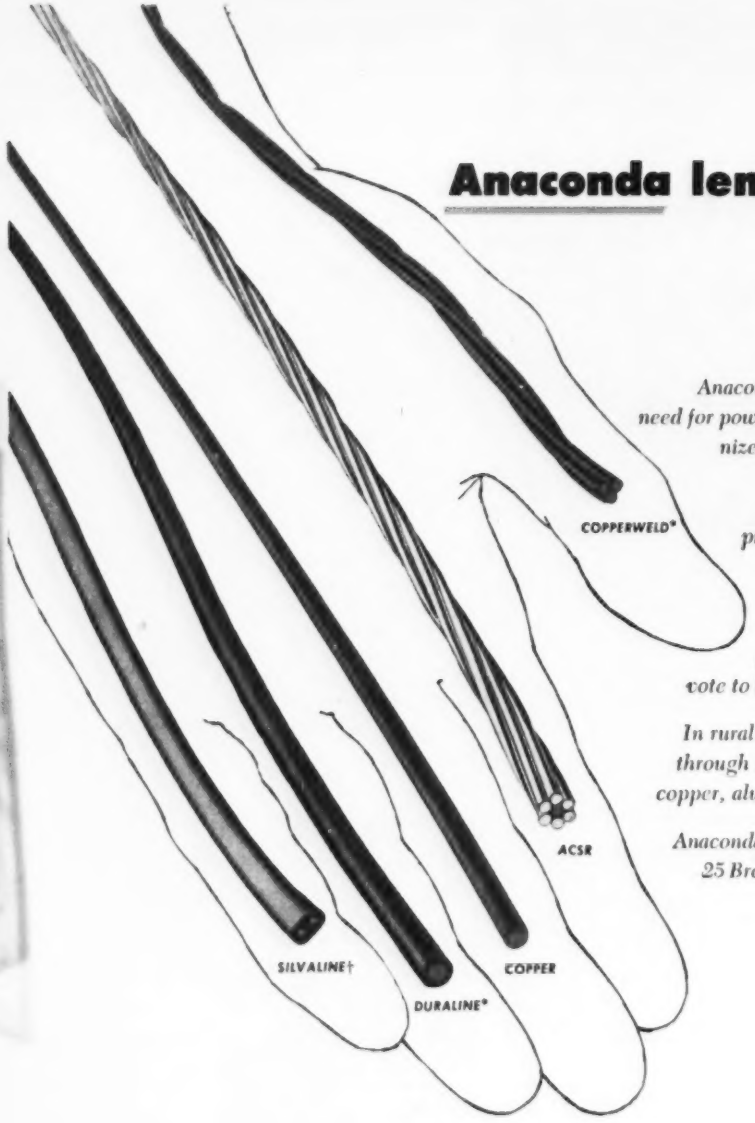


Under heavy rain and wind, contamination rapidly flushes away. Fog-Type petticoats are so shaped and spaced that rain falling on one petticoat splashes and cleans the under side of the one above. Resistance increases, leakage current falls—uniformly and over entire unit.

Lapp

LAPP INSULATOR COMPANY, INC., LEROY, NEW YORK

Anaconda lends a hand



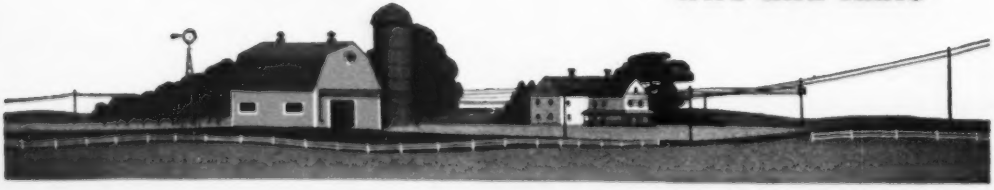
Anaconda understands the vital need for power in rural areas. It recognizes that electric power has enabled the farmer to increase his farm production . . . has relieved him from necessary but time-consuming manual labor . . . has given him free time to devote to his home and community.

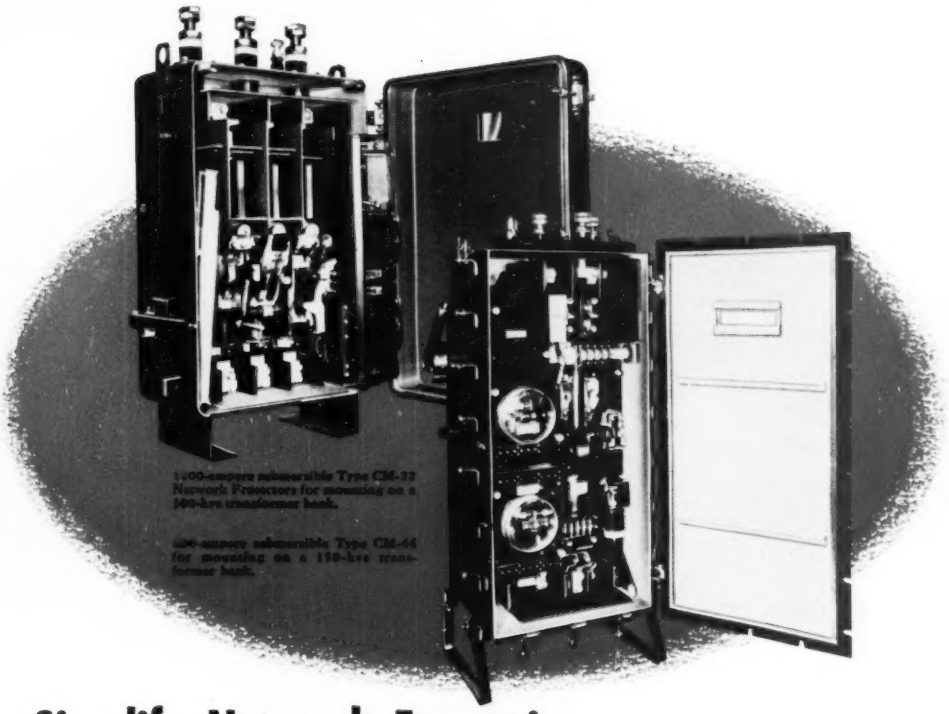
In rural installations, power flows through ANACONDA *Conductors of copper, aluminum and Copperweld.*

Anaconda Wire & Cable Company, 25 Broadway, New York 4, N. Y.

*Reg. U.S. Pat. Off. †Trademark

the right cable for the job ANACONDA® **wire and cable**





Simplify Network Expansion with Westinghouse NETWORK PROTECTORS

You can expand your network system simply—and economically—with Westinghouse Network Protectors. The reason—Westinghouse heavy-duty and medium-duty protector use the same relays. Hence, as load grows medium-duty (CM-44) protectors can be replaced with heavy-duty (CM-22) protectors and suitable transformers—*without upsetting system co-ordination!* CM-44 units may then be moved to lighter load areas.

Keep this important Westinghouse feature in mind as YOU plan your network system. It's a *sure* way to provide for simple, low-cost expansion of that system when load conditions dictate.

Ask your Westinghouse representative for further information . . . or write Westinghouse Electric Corporation, Box 868, Pittsburgh 30, Pa. J-60778

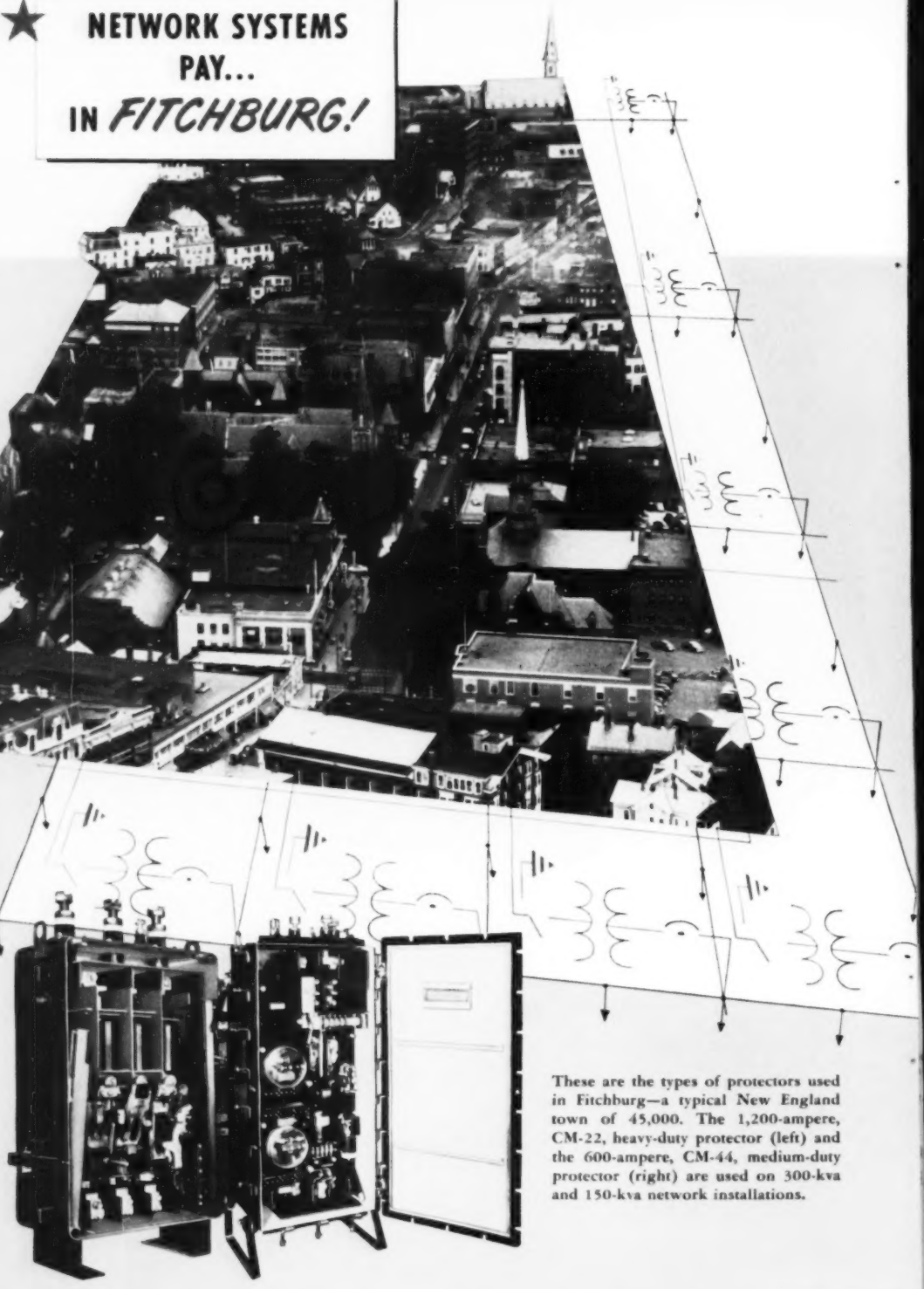
ONLY WESTINGHOUSE NETWORK RELAYS . . .

- Eliminate gears that cause friction and wear.
- Have a sensitive reverse-current setting that can be varied from .1% to 10% of the network protector rating.
- Have bearing surfaces readily accessible for inspection and cleaning.
- Have relay terminal screws that eliminate the need for additional testing facilities in the control wiring.
- Provide a nonsensitive relay that permits sensitive tripping after a time-delay.

YOU CAN BE SURE . . . IF IT'S Westinghouse

NETWORK PROTECTORS

★ NETWORK SYSTEMS PAY... IN *FITCHBURG!*



These are the types of protectors used in Fitchburg—a typical New England town of 45,000. The 1,200-ampere, CM-22, heavy-duty protector (left) and the 600-ampere, CM-44, medium-duty protector (right) are used on 300-kva and 150-kva network installations.

See how much new capacity they got without uprooting their system!

Fitchburg, Massachusetts, in 1943 was in the same predicament as many small and medium-sized cities . . . it was faced with a rapidly growing load problem. Business and industry were expanding under the stress of World War II, causing subsequent voltage-regulation and service-continuity problems. The Fitchburg Gas & Electric Company then was operating close to its installed capacity of 1,400 kva for the downtown area, served by twenty-eight 50-kva subway transformers.

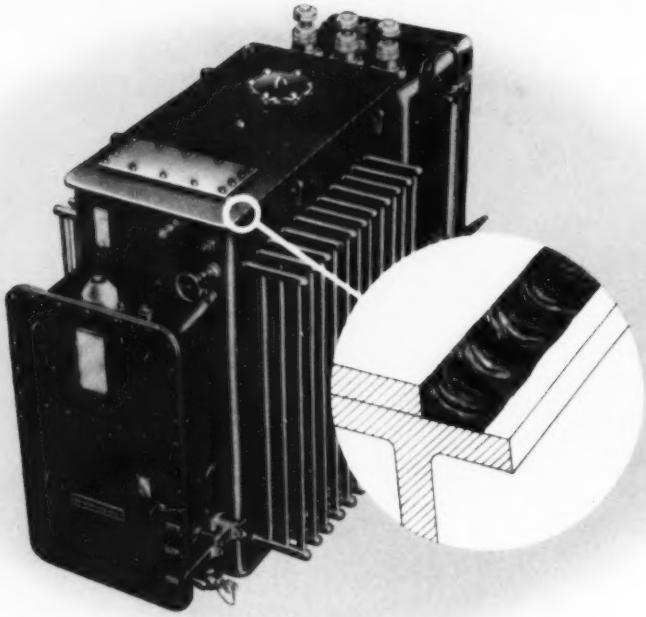
THE SELECTION OF AN A-C SECONDARY NETWORK SYSTEM proved to be the ideal solution for two important reasons. First, it utilized existing feeders with a minimum new-equipment investment. Best of all, it provided a flexible long-range solution that enabled the utility to handle a load growth of 35% and still be ready to accommodate future load growth.

THIS STORY IS BEING REPEATED ALL OVER THE U. S. A. . . . for 35% of all secondary networks are installed in towns ranging from 3,500 to 45,000 population. Main Street is loading up everywhere; and commercial areas . . . regardless of load density . . . require the complete reliability of an A-C Secondary Network System.

FIRST COST OF A NETWORK SYSTEM is a factor, but it's still generally lower than that of any other distribution system providing comparable service. Its long-range cost is definitely lower because of greater flexibility, reduced operating and maintenance costs. Layouts are simplified. Extensions, load shifts, and future changes are more easily and economically handled. In short . . . your city is ready for growth . . . that "pays off"! For the full A-C Secondary Network System story, call your nearby Westinghouse representative, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pennsylvania. J-97156

YOU CAN BE SURE . . . IF IT'S Westinghouse

NETWORK EQUIPMENT



NO COVER BOLTS! NO GASKET!

Another Maintenance Problem Reduced!

It's a major maintenance problem when oil sludges and insulation oxidizes.

Leakage of air and moisture is most likely to occur through the main cover gasket. That's why Westinghouse recommends welded-on covers for network transformers. Leaks are prevented . . . uncontrolled breathing eliminated.

It is still necessary, however, to gasket some switch and terminal chamber covers, bushings, oil gauges and handhole covers. Cortite* gaskets, composed of cork particles individually surrounded and bonded in special synthetic material, have been developed for this purpose. They provide a long-lasting, seepage-proof seal.

These two features, welded-on covers and improved gasketing for small openings, serve to greatly lessen the possibility of oil sludging and oxidation of insulation.

Removal and replacement of welded covers, if necessary, is easier and quicker than the gasket-and-bolt technique. For proof, ask your Westinghouse representative to arrange a showing of the ten-minute movie, "Welded-on". All operating and maintenance supervisors should see it. Phone today or write Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

YOU CAN BE SURE...IF IT'S

Westinghouse

NETWORK TRANSFORMERS

*Trademark

J-70622

ROLL THIS WAY!

You bet...with just a little push from you!

Our job, as we see it, is to roll wire, conduit and cable to you—to you **power companies** who light America and make the wheels turn for defense—to you **industrials** who produce the goods to make us strong—to you **contractors** who harness electricity during war and peace.

We'll roll it out as fast as is humanly possible—and here's where you can help. Try to anticipate your Triangle requirements as far ahead as possible. Such "look-ahead" ordering will help us roll it *your* way—on schedule!

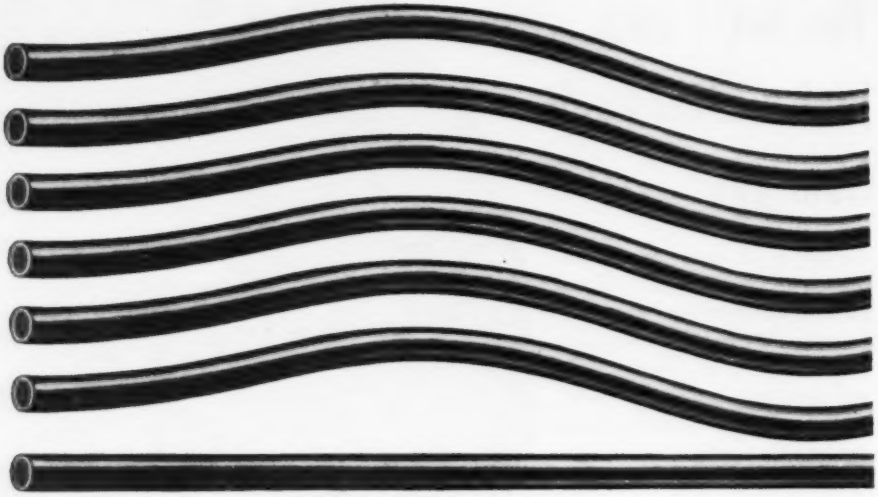
You'll save—and get it faster—through a Triangle Distributor

TRIANGLE CONDUIT & CABLE CO., INC. PERTH AMBOY, NEW JERSEY

"Glazon" Building Wire • Bare Wire • Armored Cable • "Glazon" Non-Metallic Sheathed Cable • Service Entrance, Service Drop, Varnished Cambric Braided or Leaded, Control Wire, Trioprene Trench, Power and Parkway Cables • Rigid Conduit Hot-Dipped Galvanized and Black Enameled • Electric Metallic Thin Wall Conduit • Flexible Steel Conduit

Why *FORM-SET* Strand is Easier to Work With...

Here's a magnified picture of Bethlehem Form-Set strand as you know it — assembled and ready for work. But we want you to see another picture of it, too — the seven components before they are actually put together in strand form.



Note, in this second photo, how six of the wires are permanently curled. They won't straighten out. Nor will they attempt to straighten out later, when assembled around the uncurved wire that forms the core. Reason: they've been *preformed;* virtually all internal tension has been removed.

What does this mean in terms of performance? Just this: when Form-Set strand is cut, the wires can't fly apart — not even a little bit. They stay in place, just as you see them in the top photo. The strand need never be seized. It slips into fittings as easily as a pencil would. Makes things easier for your lineman . . . co-operates in every way.

And here's a final point — Form-Set, though a preformed strand, costs little more than nonpreformed types. Why not ask for details?

BETHLEHEM STEEL COMPANY, BETHLEHEM, PA.

On the Pacific Coast Bethlehem products are sold by Bethlehem Pacific Coast Steel Corporation. *Export Distributor:* Bethlehem Steel Export Corporation

BETHLEHEM STEEL

Admiral TV

Picture Tube Leads are insulated with

NATVAR 400

EXTRUDED PLASTIC TUBING

In this Admiral Model 121 K 16 TV with 20" picture tube, the 2nd anode lead from the high voltage rectifier carries 12,500 volts to the picture tube. This important lead is insulated and protected with Natvar 400 Extruded Plastic Tubing.

Natvar

Natvar Products

- Varnished cambric—straight cut and bias
- Varnished cable tape
- Varnished canvas
- Varnished duck
- Varnished silk
- Varnished special rayon
- Varnished Fiberglas cloth
- Silicone coated Fiberglas
- Varnished papers
- Slot insulation
- Varnished tubing and sleeving
- Varnished identification markers
- Lacquered tubing and sleeving
- Extruded plastic tubing and tape
- Extruded plastic identification markers

Ask for Catalog No. 22

Admiral Corporation, in the past decade, has grown to be one of the largest and best known makers of TV and Radio Sets and Electrical Appliances. Leaders in research, design, and engineering, they have succeeded by offering *quality* merchandise at the lowest possible price.

To safeguard this quality, Admiral is extremely careful in the selection of component parts and materials. They use Natvar 400 Extruded Plastic Tubing because of its excellent electrical and mechanical properties, and because it is dependably uniform.

Natvar 400 and other Natvar flexible electrical insulating materials are available either from your wholesaler's stock or direct from our own.

THE NATIONAL VARNISHED PRODUCTS Corporation

Telephone Rahway 7-8800 — Cable Address NATVAR: Rahway, N. J.

221 RANDOLPH AVENUE ★ WOODBRIDGE, NEW JERSEY

What truck will SAVE YOU THE MOST?

The answer's a cinch! A truck that fits your job, of course. And that means a Dodge "*Job-Rated*" truck—one that's engineered at the factory for *your* kind of work.

In a Dodge "*Job-Rated*" truck, economy begins with the power plant—the right engine, operating with a high compression ratio for top gas and oil mileage. Maintenance costs are low, too, because a Dodge truck engine provides the proved advantages of such extra values as chrome-plated top piston rings and exhaust valve seat inserts.

In every phase of performance, you can depend on a thrifty Dodge "*Job-Rated*" truck to give you more for your money. You'll get greater braking safety, easier bad-weather starting, sharper turning for easier handling, extraordinary cab comfort, and smoother riding.

And you can get gyrol Fluid Drive on ½-, ¾-, and 1-ton models. This remarkable Dodge *exclusive* gives you smooth, "cushioned" power for easier driving—less wear on truck and tires—safer bad-weather operation—longer truck life. Ask for a demonstration.

For help and advice on the truck which will save you the most, see your nearby Dodge dealer.

DODGE "Job-Rated" TRUCKS

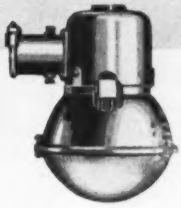
For every part of town...

L-M LUMINAIRES

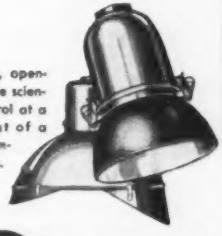
make cities brighter, safer

L-M Ovalite—Mercury Vapor Unit. Newly developed optical system assures effective light utilization and good distribution on the street. Mercury vapor lamp is in horizontal position, high up in the reflector to minimize glare. Takes 11,000, 15,000 or 20,000 lumen lamp. Optional magnetic arc control feature keeps arc centered.

L-M Spherolite This famous L-M unit is widely known for its high efficiency, versatility, and many other desirable features. Takes up to 20,000 lumen mercury vapor or 10,000 lumen incandescent lamps.



L-M Spherolite Jr. For better neighborhood lighting at an economical neighborhood price. Interchangeable with Spherolite metal or porcelain heads, permitting low cost installation of the Junior and economical replacement later with the larger luminaire if traffic growth warrants. Has many of the Spherolite features, offers many light distribution patterns.



L-M Directolites Efficient, open-type luminaires that provide scientifically designed light control at a cost little more than that of a radial bowl. Available in symmetric or asymmetric types.

● L-M provides complete street lighting equipment for all sizes of communities and all kinds of neighborhoods. There are incandescent or mercury vapor units for white way lighting. There are smaller units for residential and outlying sections. A wide variety of reflectors, deflectors and glassware provides complete control for every recommended IES light distribution pattern.

Also available are standards, brackets and mast arms, transformers, control and service equipment.

L-M street lighting engineers have years of experience and L-M's engineering service can provide the answer to your street lighting application problem.

WHICH OF THESE BULLETINS DO YOU WANT?

- ☐ Spherolite
- ☐ Directolite
- ☐ Mercury Vapor Lighting Units
- ☐ Spherolite Jr.
- ☐ Controlite®
- ☐ Street Lighting Standards
- ☐ Brackets, Mast Arms, Accessories
- ☐ Control Equipment
- ☐ Protective Lighting for industrial plants

Ask the L-M Field Engineer for the information you want, or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

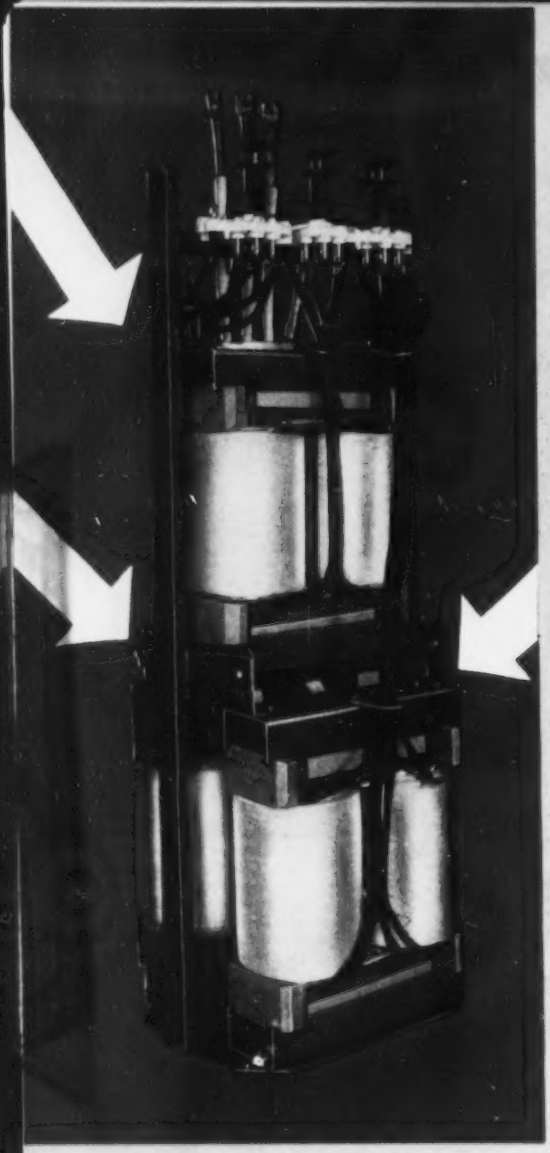
65R

Ovalite, Spherolite, and Directolite are trademarks

LM

LINE MATERIAL

Street Lighting



Three single-phase core-coil assemblies, one above and two below, for simplified mounting and best cooling. Rigidly held in strong channel-steel frame which fits into steel channels welded inside tank wall.

It's easy to replace any one unit in L-M 3-PHASE ROUND WOUNDS®

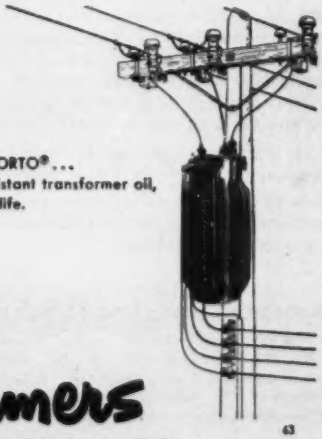
L-M Round-Wound transformers have exceedingly high impulse strength and overload capacity so that burnouts are extremely rare. But if a coil *should* burn out, you don't have to replace the whole transformer. The core-coil assembly from any one phase is simply removed from the rack and a replacement unit quickly installed.

It's as simple as that, and almost as quick . . . whether it's done in your own shops or in one of the authorized L-M Transformer Service Shops near you.

Under emergency conditions you can restore service in a hurry because with L-M construction you can connect two units in open wye or delta.

Besides the advantages of rapid core-coil replacement and fast service restoration, L-M 3-phase transformers give you all the desirable Round-Wound performance features . . . with the wound core that isn't cut or disturbed in any way after annealing . . . with the round coils wound right onto the core. An L-M "exclusive!"

Get the whole story. Ask the L-M Field Engineer or write Line Material Company, Transformer Division, Zanesville, Ohio (a McGraw Electric Company Division).



Now furnished with ORTO®... L-M's oxidation-resistant transformer oil, inhibited for longer life.

LM®

LINE MATERIAL Transformers

Complete Coordinated Equipment for Distribution Today

You get GREATER ultimate strength

in L-M's new reinforced wireholder

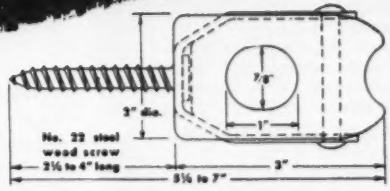
L-M's new wireholder is as tough and strong as they come. In over-all comparative tests it exceeded most others tested based on both dead-end pull and 90° side pull.

It was developed only after extensive tests of a number of designs, in order to give you the greatest possible ultimate strength.

Screw is long, sharp, firmly fixed—with choice of screw lengths from 2¼ to 4 inches. With porcelain base directly against the wood, there is less danger of cracking the porcelain than when it is in contact with a metal ring. Porcelain has a good, well-rounded design, to avoid abrasion of wire.

It's a good wireholder, typical of the many line construction materials L-M offers.

IMPROVED DESIGN OFFERS GREATER RESISTANCE TO DEAD-END AND SIDE PULL



COMPARATIVE STRENGTH TESTS

TYPE AND MAKE OF WIREHOLDER	AVERAGE ULTIMATE STRENGTH, POUNDS	
	Dead End Pull	Side Pull, 90°
L-M New	1800 lbs.	1600 lbs.
L-M Old	1750	1500
Make A	1600	925
Make B	1100	975
Make C	2300	825
Make D	1800	925

Want samples, prices?

Ask the L-M Field Engineer; or write Line Material Company, Milwaukee 1, Wisconsin (a McGraw Electric Company Division).

LINE MATERIAL
Line Construction Materials

LM

Complete Coordinated Equipment for Distribution Today

Now you get DOUBLE holding power

L-M Guy Clamps with TORKOL-Treated Nuts Work Faster, Easier!

Now you can use *one* guy clamp where you formerly used two! Tests show that with Torkol nut lubricant—an L-M "exclusive"—wrench torque develops twice the normal holding power of an untreated clamp. High strength, heat-treated bolts assure plenty of extra strength.

THESE TESTS TELL THE TORKOL STORY

Recent tests compared the holding power of Torkol-treated 3-bolt clamps with untreated 3-bolt clamps. The pull required to produce ⅛-inch slip of the guy strand was measured for a wide range of wrench-torque values. Results were plotted into comparative "Nut-Torque vs. Holding Power" curves shown at the right.

SEE WHAT A DIFFERENCE!

To hold a pull of 7000 pounds, using ¾" high strength guy strand and clamps with ⅝" dia. bolts, required the following nut torques:

with *un*treated clamps, 120 foot-pounds torque;

with Torkol-treated clamps, 52 foot-pounds—less than half as much!

The extra holding power of L-M Torkol-treated guy clamps often permits the use of a clamp with smaller bolts. For example: With 3-bolt clamps with ⅝" bolts, on ⅜" HS strand, with 90 foot-pounds of torque:

*un*treated clamp held a 5800-pound pull;

Torkol-treated clamp held 12,400 lbs.

With a 3-bolt clamp with ½" bolts:

*un*treated clamp held a 3800-pound pull;

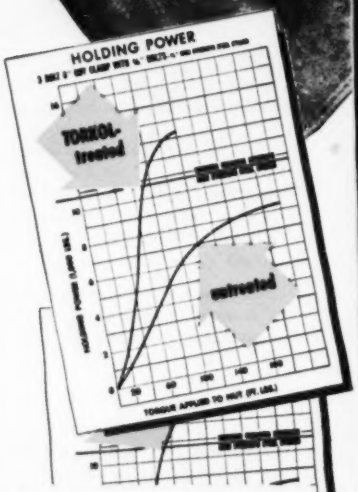
Torkol-treated clamp held 9700 pounds.

The Torkol-treated clamp with ½" bolts held 3900 pounds more than the untreated clamp with ⅝" bolts! The possible savings are obvious.

SERVES YOU BETTER—COSTS NO MORE

With L-M Guy Clamps, you save on material, cut installation time, and get far better strength-balance in the whole guying installation. What's more, Torkol-treated L-M clamps contribute to worker-safety, for they seldom require heavy muscular effort with its risks of straining and danger. *And L-M Torkol-treated clamps cost you no more!*

Torkol is a Line Material Trademark



GET THESE NEW FACTS ON "TORKOL"

Want a complete set of these new Torkol test curves? Eight charts cover the guy-strand range from ¼" to ½"—and permit coordination of guy clamp holding strength with that of other components. Ask your L-M Field Engineer, or write Line Material Company, Milwaukee 1, Wis. (a McGraw Electric Company Division).

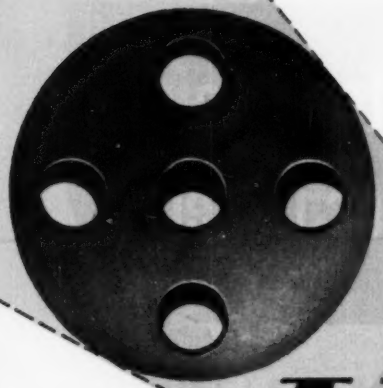
L-M Guy Clamps are made in styles from one to four bolts, of heavily galvanized steel. Smooth grooves with rounded edges prevent strand damage. The high-strength bolts may be inserted from either side.

All nuts are Torkol-treated—identified by their yellowish color. They go on quickly, stay tight, unscrew easily, may be reused. Clean. Dry. Unaffected by weather or weather changes.

LINE MATERIAL

Line Construction Materials

Complete Coordinated Equipment for Distribution Today



the only lightning arrester with the LENS that gives it such high discharge capacity and unchanging characteristics

An ingeniously designed lens electrode is placed in the valve element of *every* L-M valve type arrester. This exclusive L-M feature performs an extremely valuable function that accounts for the exceptional performance and long life of L-M arresters.

Here's why. Lightning surge current tends to "skin" down the outside of the valve element, just as 60-cycle current will flow on the skin of a conductor. This results in only a small portion of the valve element being used to handle lightning surges. Thus the surge capacity of what might be a good arrester is materially lowered—the valve element will fail in time due to the excessive concentration of current on the outer skin.

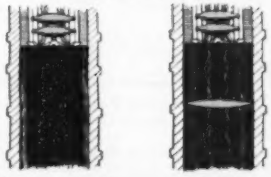
The L-M lens electrode completely counteracts lightning surge current "skin effect." The full cross-section of the valve element is available for extremely high surges—considerably in excess of 65,000 amperes.

The lens does the job. It distributes the surge evenly throughout the valve element—doesn't allow it to concentrate in any one path and thus clinker the element.

That's one reason why an L-M arrester can take more and heavier surges—why it maintains its high discharge capacity without change, for years and years . . . why its rate of failure is so gratifyingly low.

Get the whole story on L-M arrester performance, including some utility company records which substantiate what we say. Ask the L-M Field Engineer, or write Line Material Co., Milwaukee 1, Wis. (a McGraw Electric Company Division).

Here's What Happens



Without LENS
Surge channels down sides of element.

With LENS
Surge goes through the entire element.

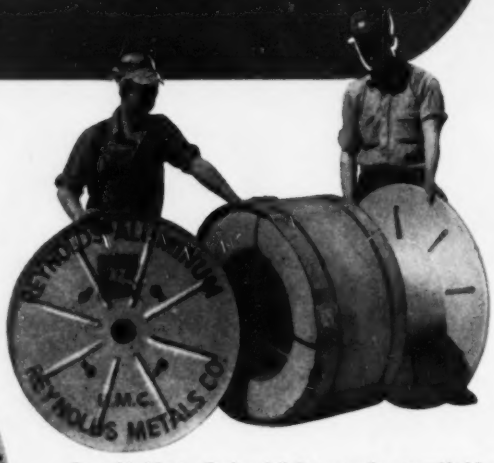
LINE MATERIAL
Lightning Arresters

Complete Coordinated Equipment for Distribution Today

NOW 4 Reynolds Master Reels Do the Work of 100 Wooden Reels

Handle ACSR quicker, more economically
Eliminate inventory and exchange

Almost every cable user wants to convert to the modern Reynolds ACSR Master Reel and Coil system. And no wonder! These smart operators eliminate *all* problems connected with wooden reels. The Reynolds Master Reel eliminates handling, storing, record keeping, as well as cutting damage cost to a minimum.



Reynolds Master Reel and Coil are easily assembled by linemen right on the job.

Reynolds Master Coils hold the same amount of conductor as conventional wooden reels. The cable is carefully waterproofed, lagged and banded — completely protected against rough handling. The Reynolds Master Reel is all metal, quickly taken apart and put back together around the Master Coil. It is far sturdier than a wooden reel and can be used over and over again.

Find out about this revolutionary method of solving your cable and reel problems. You will cut your costs with this time- and money-saving cable handling method.

Reynolds Master Reel and Coil save time, money, labor —are sturdier than wooden reels.

FREE ACSR MANUAL FOR ENGINEERS CONTAINS COMPLETE INFORMATION, CHARTS AND TABLES. Please request this booklet on your business letterhead.

For Complete Information
see your Reynolds distributors listed below or write direct to
Reynolds Metals Company, 2584 South Third Street, Louisville 1, Kentucky.

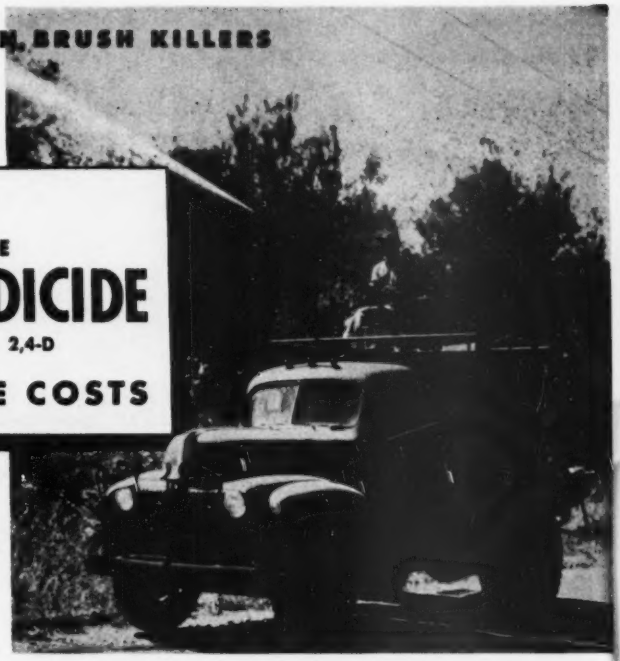
Westinghouse Electric Supply Co., New York, N. Y. (And branches) • North Coast Electric Co., Seattle, Wash. Griffin Manufacturing Co., Dallas, Texas • Southern Electric Supply Co., Houston, Texas • Williamson Sales Co., Shreveport, Louisiana (And branches) • California Electric Supply Corp., San Francisco, California

REYNOLDS METALS

REYNOLDS ALUMINUM

Thompson Chemicals

FIRST NAME IN BRUSH KILLERS



New.... Superior

LOW VOLATILE

BRAMBLE-WEEDICIDE

2,4,5-T **2,4-D**

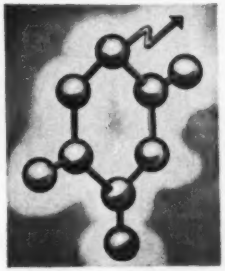
CUTS CLEARANCE COSTS

- **PENTYL ESTERS FOR LOW VOLATILITY**
- **EXTRA HIGH SURFACE CREEP FOR EXTRA KILL**
- **ABSORPTION RATED FOR EFFICIENT WOODY GROWTH CONTROL**

Delivers More Killing Units Per Dollar

Bramble-Weedicide, the new, improved Thompson brush killer specially recommended for clearing rights of way, is 70% more economical than mechanical or hand clearing methods. Up to 25% more effective and economical than older chemical controls.

Whether you spray foliage by air, truck or tractor or from knapsack, or employ basal bark treatment, you get positive kills of even hardiest species at lowest cost per mile with Thompson's superior Bramble-Weedicide.



Special low volatile tailor-made pentyl esters, absorption rated for quicker translocation, more effective results. An exclusive creeping agent adds increased surface contact on leaf or stem for extra action.

Write, describing nature of growth and type of job for helpful information on what to apply, how to mix and when to spray for maximum economy and effectiveness. Thompson manufactures many kinds of brush and weed killers. Caution: Order NOW to be assured of ample supply.

DISTRIBUTORS: SOME TERRITORIES STILL OPEN

Thompson

other Thompson Chemicals superior

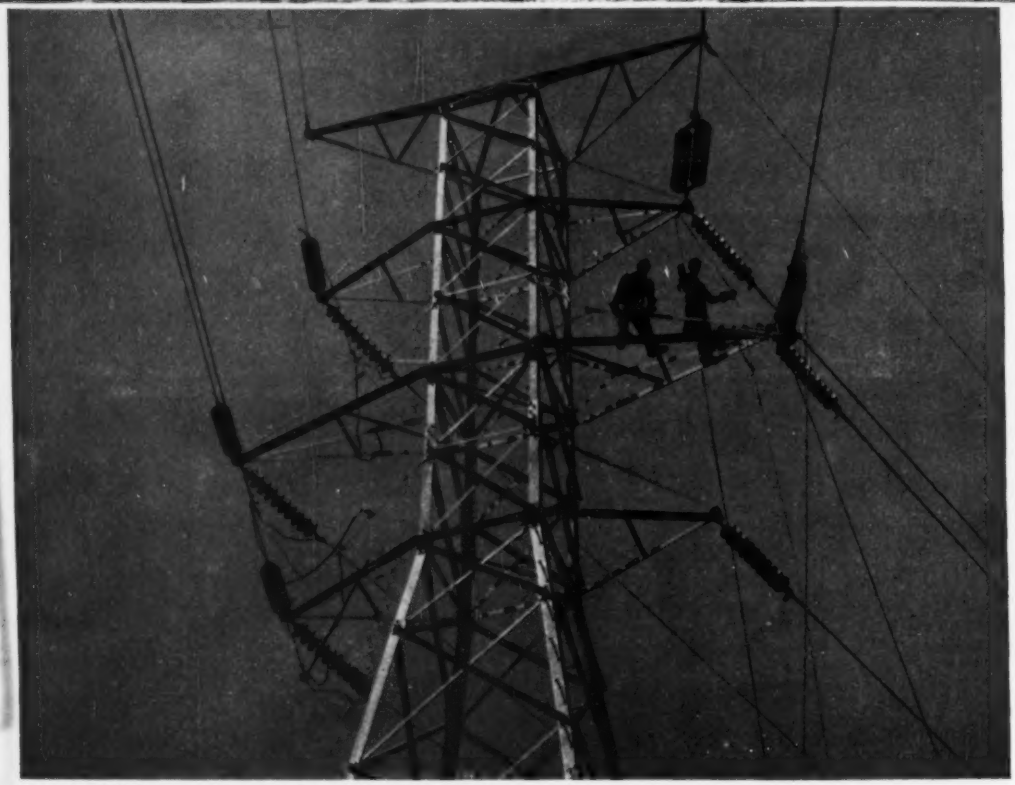
WEED & BRUSH KILLERS

- **WEEDICIDES:** 2,4-D Esters and Amines
- **BRAMBLCIDE** 2,4,5-T Low Volatile Ester
- **PHYTOCIDE** } General Weed Killers
- **PENTA-WEEDICIDE** }

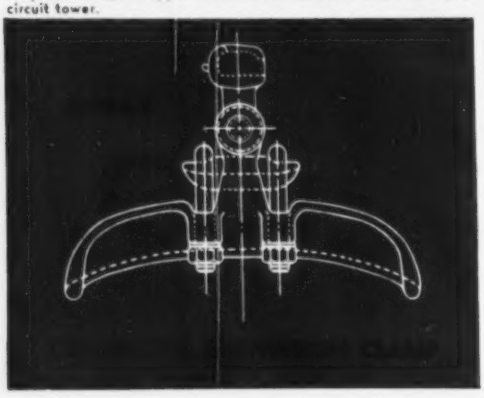
Thompson **CHEMICALS CORP.**

St. Louis 3, Missouri
Los Angeles 27, California

Baltimore boosts its



MEN AT WORK Linemen install 556,500 cm ACSR conductors in place of 2/0 copper transmission conductors on this two-circuit tower.

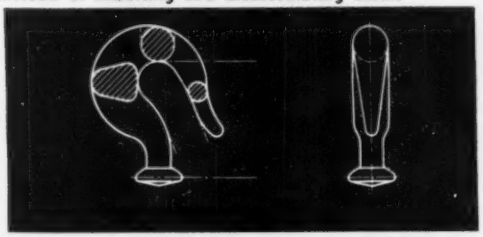


IN THE SPRING OF 1950, the Consolidated Gas Electric Light and Power Company of Baltimore began rebuilding its 110 kv ring system. This project was undertaken because studies of future load growth and planned generating facilities indicated the need for greater transmission line capacity.

THE COMPANY'S RING SYSTEM extends some 58 miles around the City of Baltimore, connecting generating stations at Westport and Riverside. Transmission conductors for the most part were 2/0 copper, with the remainder generally consisting of 4/0 copper. The Consolidated Gas Electric Light and Power Company's project called for replacement of these conductors with 556,500 cm ACSR on approximately 46 miles of line.

THE PROJECT INCLUDED the building of some 16.4 miles of additional line on right-of-way adjoining existing transmission lines. At several locations in this

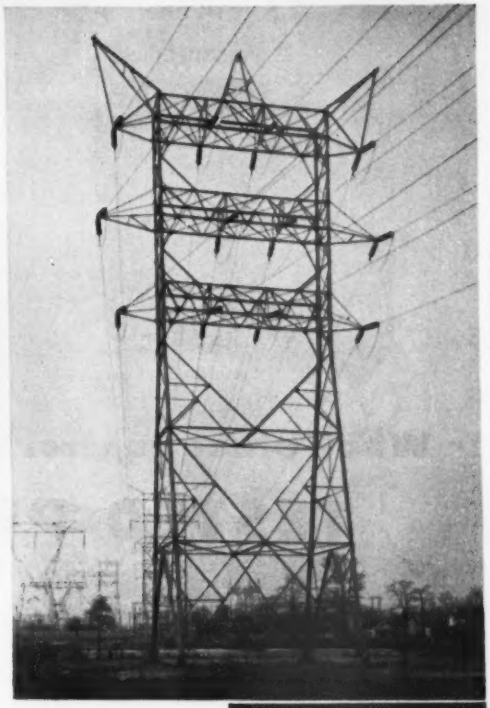
section, right-of-way limitations required the replacement of two-circuit transmission towers with four-circuit towers. This was accomplished under limited outage conditions by erecting temporary wood pole bypass lines which were operated while the two-circuit towers were replaced with the new four-circuit towers. In another section of the ring system, approximately 23.3 miles of transmission line including towers and conductors were replaced with heavier towers and ACSR conductors on the existing right-of-way. This was accomplished by installing new towers with split crossarms, after which the old towers were pulled over instead of unbolting and disassembling them.



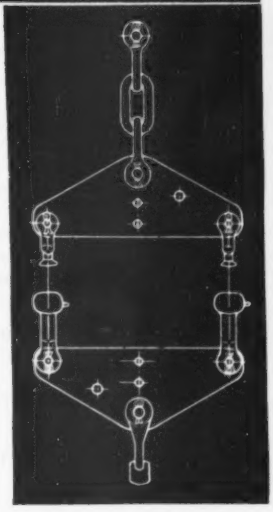
WITH THE WORK IN PROGRESS during high peak load periods and during the summer storm season, other special methods were devised to facilitate the completion of the project on schedule. In addition, transmission towers along 16.7 miles of line had to be reinforced to provide for the increased loading of the larger ACSR conductors.

Like so many major power concerns, Consolidated Gas Electric Light and Power Company of Baltimore used BTC Hi-Line Hardware on this project. Writes the company: "We have every reason to believe that its performance will be satisfactory." Specify BTC Drop Forged Clamps and Fittings for all your transmission line projects. You'll find they're easier to install . . . give trouble-free performance . . . and help hold maintenance to a minimum.

Sold through your insulator manufacturer only



PROJECT COMPLETED New four-circuit transmission towers like this replace two-circuit towers in several locations along Consolidated Gas Electric Light and Power Company's newly rebuilt 110 kv ring system.



Drop Forged* BTC *Hi-Line Hardware

The BREWER-TITCHENER Corporation

Cortland · New York

What other control center gives you this

TESTED PROTECTION

Your control center holds the life line to your motors. Such guardianship demands top-quality construction, at *every* point, to provide complete protection.

Westinghouse Control Centers are built to give you this protection and laboratory tested to prove it:

1. **Complete Baffling** of each starter unit in Westinghouse Control Centers is a typical example of the fruits of this thorough testing at the Westinghouse High Power Laboratory. When interrupting a short circuit on a starter unit of non-baffled design, tests showed the short circuit could spread throughout the entire structure. Each Westinghouse starter unit is completely baffled to prevent these explosive chain reactions. Unusual arcing is localized if faults occur.

2. **Ample Interrupting Capacity** is another tested feature of Westinghouse Control Centers. Each starter circuit breaker has a capacity of interrupting a fault current of not less than 15,000 RMS amps.

3. **Sturdy, Self-Supporting, Tight Structures** also are on the list of Westinghouse quality features. Each panel is built to stand by itself and to protect the internal electrical equipment.

You will want to know of the many other points of quality that make up Westinghouse Control Centers. Write for your copy of Booklet B-4213 which contains all the facts. Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa.

J-27010

Westinghouse

CONTROL CENTERS

Here's a great new Burroughs to speed your ledger posting

Never before have utilities had the opportunity to mechanize ledger posting at such moderate cost—because never before has there been a medium-priced machine so flexible and fast, so easy to operate, as the sensational Burroughs Sensimatic.

This is the all-new, amazingly versatile figuring tool—the machine with a "mechanical brain" that directs it through every accounting job swiftly, easily, accurately. The Sensimatic makes possible the complete mechanization of all your posting work from a single machine.

Investigate now. Learn how the Sensimatic can save dollars, hours and effort . . . how surprisingly little it costs to own. Write for complete information. Burroughs Adding Machine Co., Detroit 32, Mich.

Handles all These Jobs *and more*

- Operating Ledgers
- Work Order Ledgers
- General Ledger
- Material and Supplies Ledgers
- Bank Ledger
- Revenue Ledgers
- Accounts Receivable Control Ledgers
- Stockholders Ledger
- Operating Statements

It's the Sensational

Burroughs Sensimatic

accounting machine

WHEREVER THERE'S BUSINESS THERE'S **Burroughs**

OPERATIONAL RATING —

Better Than 99% PERFECT!
1 Glass Body for Easy Gap Inspection
2 Vent Openings Prevent Corrosion
3 High Speed Multiple Arcing Unit
4 Oxidized Silicon Carbide Valve Element
ESM 1
ESM 2
ESM 3
ESM 4

Crystal Valve Ventilated Spark Gap Arresters have built an amazing record of operating efficiency — better than 99% perfect! This rating has been established over 16 years of operation . . . under adverse conditions . . . in thousands of installations.

In addition to high speed, efficient protection provided, elimination of radio interference and freedom from gap electrode corrosion are plus features. Other advantages include high speed multiple arcing unit and oxidized silicon carbide valve element for fast operation.

Ventilated spark gap structure permits movement of air in and out of spark gap housing, and circulation within housing. Air movement prevents moisture accumulation and danger of corrosion.

Write Dep't 1709 for new folder containing complete data on Crystal Valve Ventilated Spark Gap Arresters.

ELECTRIC SERVICE MANUFACTURING CO., PHILA. 32, PA.

CRYSTAL VALVE

LIGHTNING ARRESTERS

Principles of Ventilated Spark Gap Arresters

by

J. R. McFarlin, Vice President
ELECTRIC SERVICE MANUFACTURING CO.

The failure rate of modern lightning arresters from all causes is relatively low; of the small percentage that do fail one of the causes frequently has to do with the accumulation of moisture in the spark gap chamber, this followed by corrosion of the spark gap electrodes. The obvious means to correct this condition is to prevent accumulation of moisture in the spark gap chamber; this may be accomplished by ventilation.

Ventilation of lightning arresters is nothing new; 60 or 70 years ago arrester units for outdoor service were generally installed in wood boxes provided with hinged doors; with such construction these were completely ventilated and rarely were the units afflicted with corrosion due to moisture. Ventilation of the modern porcelain housed lightning arrester is not so simple, but can be and has been done for many years.

Some 35 years ago Electric Service Manufacturing Company developed and manufactured multi-gap resistance type arresters, the elements of which were enclosed in a porcelain housing which was vented at the lower or ground end; these, so far as we know, were entirely free from moisture trouble.

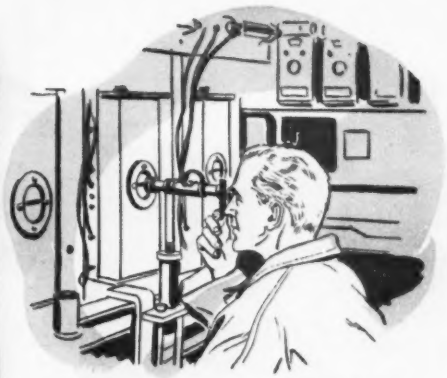
Some 16 years ago manufacture of Crystal Valve lightning arresters with ventilated spark gap structures was begun; these arresters have been sold throughout the world and to date not a single case of moisture trouble has come to our attention.

These arresters for 3.0 KV service are made in a 1-piece porcelain body; for 6.0 to 15.0 KV, inc., they are made in a composite body employing glass for housing the spark gap assembly and porcelain for housing the valve element; an illustration of the latter type appears on this page. The spark gap element of these higher voltage units is ventilated by means of openings between the glass and porcelain housings—see "2" in illustration; for the 3.0 KV units ventilation is provided by shielded openings in the base seal.

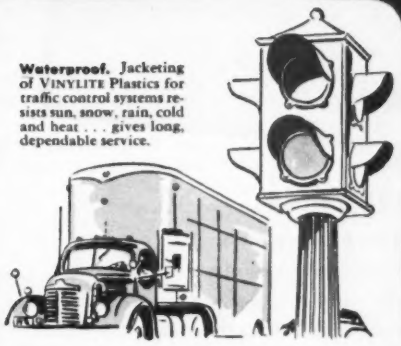
In both cases this ventilation provides free access of air in and out of the spark gap housing and circulation within the housing; any moist air that may be breathed into the housing due to decreasing ambient temperature will be breathed out when the ambient temperature increases; none of it will be retained and accumulated. The result is that the interior of the housing is maintained in a dry condition and the spark gap elements are kept dry and clean and therefore are not subject to deterioration or corrosion from moisture.

(*Advertisement*)

Cold. Railroad control cables and signal wire jacketed with VINYLITE Plastic stand low temperature duct installation . . . resist oils, greases, abrasion.



Chemicals. Cable for automatic chemical control processes must resist acids, alkalies, alcohols, corrosive fumes. Jackets of VINYLITE Plastic meet the test.



Waterproof. Jacketing of VINYLITE Plastics for traffic control systems resists sun, snow, rain, cold and heat . . . gives long, dependable service.

Get the Upperhand on Wire Hazards

SPECIFY JACKETING OF VINYLITE BRAND PLASTICS

CONTROL CABLE FAILURE can mean costly loss—in man-hours, money and equipment. That's why in so many fields—municipal, railroads, chemical plants—it pays to specify jacketing of VINYLITE Brand Plastic with polyethylene cores. These materials are particularly formulated to resist hazards encountered during duct installation at low temperatures and are flexible down to minus 67 deg. F. VINYLITE and BAKELITE polyethylene are outstanding in resistance to water immersion and soil burial and *have a far longer service life than ordinary insulating materials.*

Their small overall diameter for a given wire gauge means less expense. Easy to strip and splice, they speed installation. Their lasting colors make color-keying positive and permanent.

Whether you are producing for military or civilian needs, there's sure to be wire and cable insulated with VINYLITE Plastics to fit your needs. Write for a representative list of suppliers. Address Dept. MF-28.

MEMO TO WIRE MANUFACTURERS

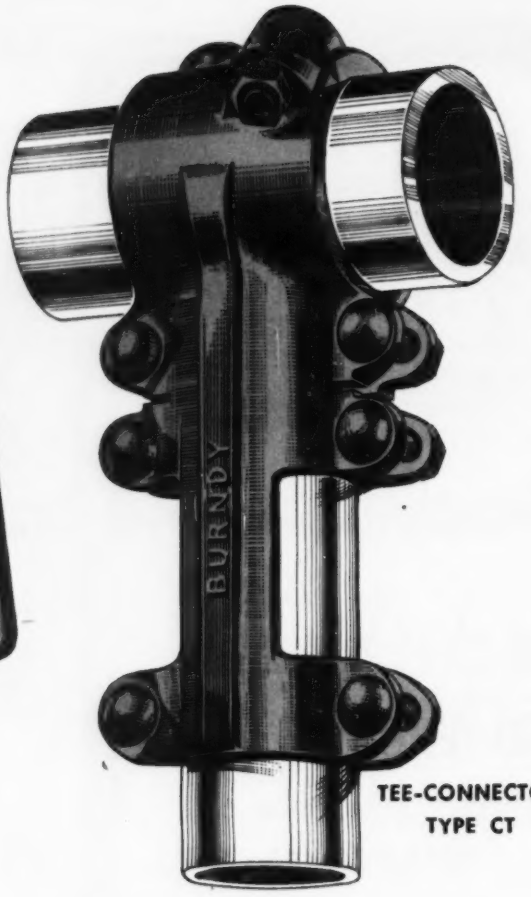
Producing wire that will stand up to chemical plant conditions is a difficult engineering problem. Learn about the latest advances in this field. Send for *Kabelitems No. 54*, entitled "Plastic Insulated Cables for Chemical Plants." It's a mine of information you will want to have. A copy is yours for the asking.

Vinylite BRAND **PLASTICS**

TRADE MARK

BAKELITE COMPANY
A Division of
Union Carbide and Carbon Corporation
30 East 42nd Street, New York 17, N. Y.

Check List for a Dependable Power Connector



TEE-CONNECTOR
TYPE CT

electrically

- ☐ Conductivity greater than conductor
- ☐ Cooler than conductor—under all loads
- ☐ Corrosion resistant—salt, acid or smog
- ☐ Reserve capacity for overloads
- ☐ Minimum contact resistance

mechanically

- ☐ Sustained clamping pressure
- ☐ Withstand wind, icing and thermal expansion
- ☐ Protects against vibration
- ☐ Takes short circuit stresses and lightning surges
- ☐ Readily stands high installation torques
- ☐ Simple installation—with common wrench
- ☐ No waste metal—engineered for the job

BURNDY CONNECTORS

fully engineered—fully tested

From design to delivery each Burndy power connector is fully engineered—every step. Each design is laboratory checked and service tested against the most severe performance requirements. Burndy quality control engineers make sure that each Burndy connector shipped to you fully lives up to the most exacting standards in the electrical industry. When you connect with Burndy, you connect with the most dependable connector that money can buy.

BURNDY

52-11

BURNDY ENGINEERING COMPANY · NORWALK, CONNECT. BURNDY CANADA, LTD., TORONTO 8, ONT.

SAVE COPPER

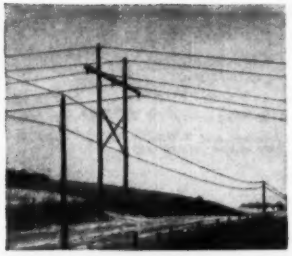
with Copperweld Wire

TRADE MARK

and DO A BETTER JOB - AT LOWER COST!

There are many places where you can use Copperweld* Wire to realize copper savings of 60% or more—with no loss in electrical efficiency. The following tested and proved applications are good examples.

*Trade Mark

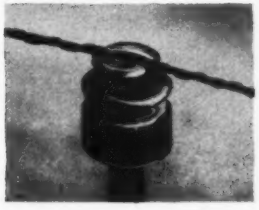


POWER CONDUCTORS

For lightly loaded primary extensions serving small groups of customers, 3 No. 12 or 3 No. 10 Copperweld Conductors usually provide ample conductance and strength for safer long spans. Compared with No. 6 Awg copper, the usual minimum size of copper wire used for overhead construction, the 3 No. 12 Copperweld Conductor saves approximately 600 pounds of copper per mile of single-phase line. Also, for high voltage transmission lines such as 66-kv and 132-kv, Copperweld Strands may be used to carry the smaller currents. Here, copper savings range from 60 to 70%.

GROUNDING WIRES

Annealed Copperweld Grounding Wire is excellent for pole protection and for making the ground connection from overhead ground wires and lightning terminals. In conducting lightning discharges to ground, the electrical properties of Copperweld are similar to those of solid copper of the same diameter. On these installations, there is a copper saving of 70%.



TIE WIRES

Annealed Copperweld Wire can also be used for tying copper-type power conductors to insulators. For this application, the requirements are copper surface, adequate strength, and good pliability. Many companies use Copperweld Tie Wires two sizes smaller than copper thus obtaining a copper saving approaching 80%.

Always consider Copperweld—the copper-saving wire that gives you dependability at lower cost.

Copperweld Wire uses only enough copper to do what copper does best—conduct electricity and resist corrosion. The protected steel core provides permanent high strength which assures greater safety and less maintenance expense.

COPPERWELD STEEL COMPANY

Glassport, Pa. SALES OFFICES IN PRINCIPAL CITIES

SORGEL AIR-COOLED DRY-TYPE TRANSFORMERS

Sub-Stations and Power Centers

for indoor installations

Engineered to meet your exact requirements

Not necessary to design or change your installation to fit a "standard"

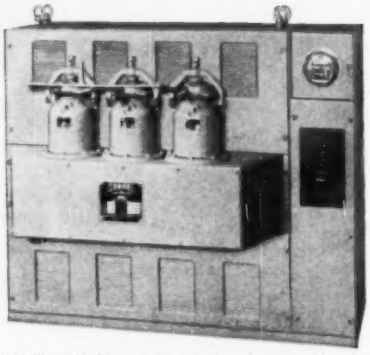
Any type of primary switch gear.
Metering—primary or secondary, to suit.
Secondary breakers, main, branch, or tie.

Interlocked or automatic throw-over. Draw-out or stationary types. Magnetic trip, or thermal, or combination.

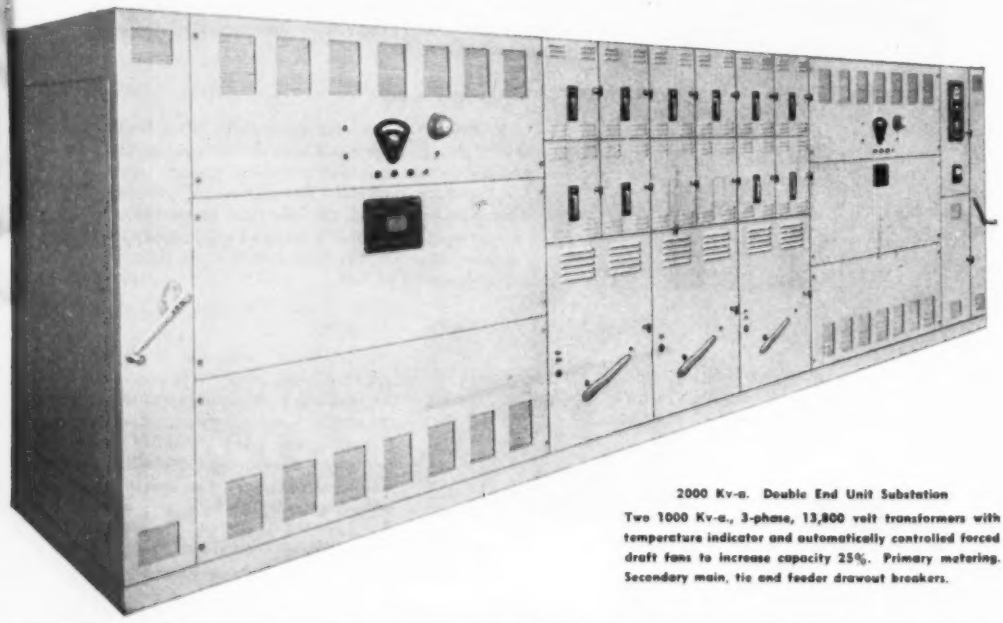
All incorporated with high quality, liberally designed **SORGEL Air-Cooled Transformers.**

All factory wired, tested and assembled. Mounted on a substantial steel base. Shipped as a single unit or in sections, accurately co-ordinated for easy assembly on the job.

Sizes up to 2000 Kv-a. All voltages up to 15 KV.



200 Kv-a. 3-phase, 4160 volt transformer equipped with G & W primary oil fuse cutouts. Secondary circuit breaker and K.W.H. meter.



2000 Kv-a. Double End Unit Substation

Two 1000 Kv-a., 3-phase, 13,800 volt transformers with temperature indicator and automatically controlled forced draft fans to increase capacity 25%. Primary metering. Secondary main, tie and feeder drawout breakers.

Sales Engineers in Principal Cities

SORGEL ELECTRIC CO., 834 West National Ave., Milwaukee 4, Wis.

Pioneers in the development and manufacturing of Air-Cooled transformers

Edward M. Graham station of Bangor Hydro Electric Company, Bangor, Me.

In the Valley of the Penobscot

Exide-Manchex BATTERIES

Installation of 60 EME-15 Exide-Manchex Batteries in gas turbine station of Bangor Hydro Electric Company.

Here in the heart of Down-East Maine is one of America's most modern electric utilities—the Bangor Hydro Electric Company. It was the first to use a regenerative type gas turbine, the installation of which aroused widespread interest in the industry. Other items of equipment are equally modern. Among them are Exide-Manchex Batteries.

The Exide-Manchex Batteries in the Edward M. Graham station provide power for switchgear operation. They furnish adequate emergency lighting, operate 60 indicating lamps, and run two 2-hp. lubricating pump motors. Exide-Manchex Batteries are preferred by many outstanding utility companies because they assure:

POSITIVE OPERATION: Dependable performance at ample voltage with no switching failures.

INSTANTANEOUS POWER: High rates for switchgear operation with adequate reserve power for dependable performance of all other control circuits and for emergency lighting.

LOW OPERATING COST: Extremely low internal resistance.

LOW MAINTENANCE COSTS: Water required about twice a year. No change of chemical solution needed during life of battery.

LOW DEPRECIATION: Sturdy, long-life construction.

GREATER CAPACITY in a given amount of space avoids overcrowding of equipment.

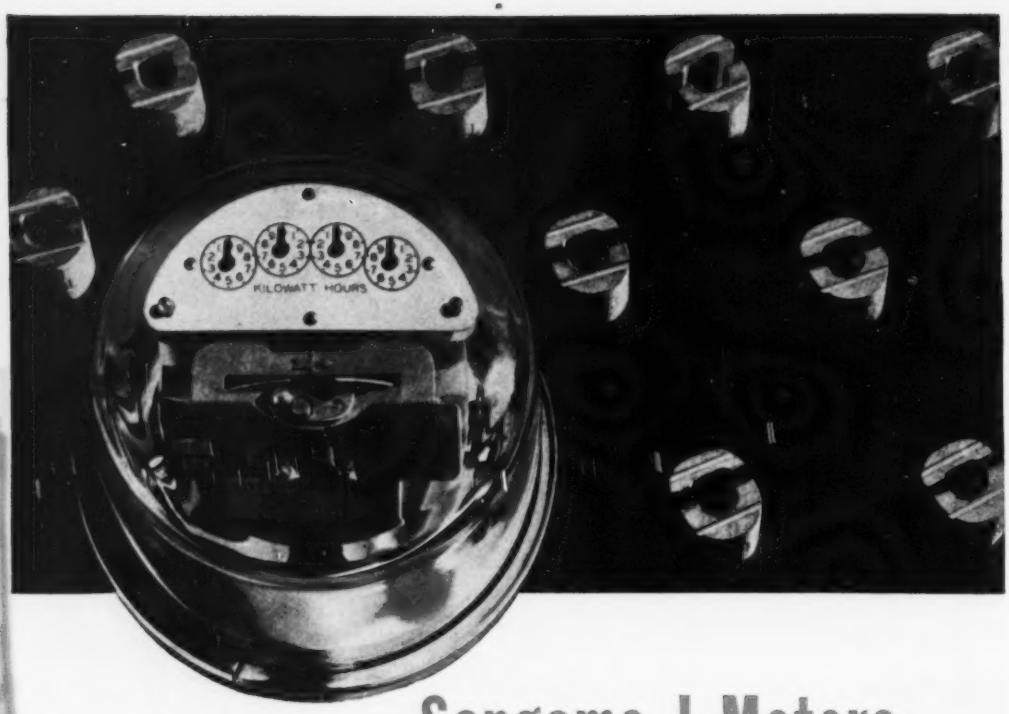
These features combine to make Exide-Manchex *your best battery buy* for all control and substation services.

You get all these features in the Exide-Manchex

- The *exclusive*, long-life manchester positive plate.
- Slotted plastic separators, impervious to chemical and electrical reaction.
- Plastic spacers for plate alignment.
- Latest development in molded glass jars.
- Heavy terminal posts with copper inserts for extra conductivity.

THE ELECTRIC STORAGE BATTERY COMPANY
Philadelphia 2
Exide Batteries of Canada, Limited, Toronto
"Exide" and "Manchex" *Reg. Trade-marks U.S. Pat. Off.*

1888...DEPENDABLE BATTERIES FOR 64 YEARS...1952



Sangamo J Meters

have damping magnets that are *permanent*

Sangamo Type J Watthour Meters are equipped with surge-proof alnico damping magnets to completely eliminate change in calibration.

Because the damping magnets control the speed of the meter, accuracy depends on the permanence of their strength. Alnico has many times the resistance to the demagnetizing effects of lightning surges as the best forged steel magnet materials.

The aluminum mounting clamp provides additional protection since it acts as an effective shield, further insuring the permanence of the damping force.

No report has ever been received of a J Meter speeding up in service due to loss in damping strength . . . and more than five million Sangamo Type J Watthour Meters are in service . . . many for more than ten years!

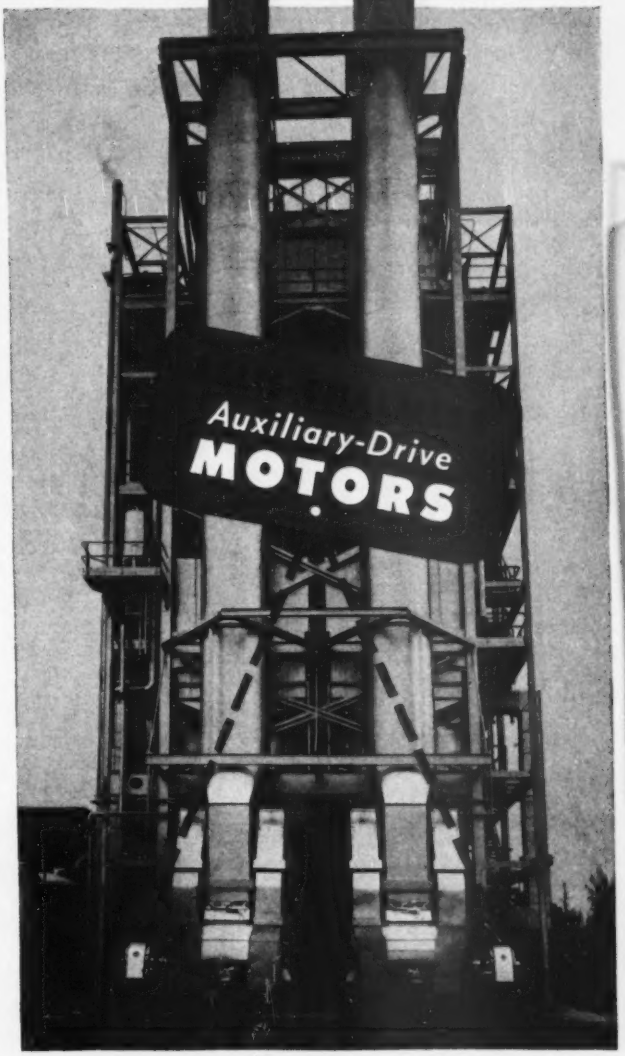
Only Measured Facts are Known Facts

SANGAMO
ELECTRIC COMPANY
SPRINGFIELD, ILLINOIS

Sangamo J Meters have proved their ability to meet today's requirements and tomorrow's anticipated loads with sustained accuracy, economy of maintenance and troublefree performance.

SM52-3

No "Cover" Charge Here!



THE INDUCED-DRAFT FAN MOTORS look pretty small right out in the open air at the base of the towering stacks. But with today's building costs there would have been nothing small about the "cover" charge for brick and mortar walls and a steel-braced roof to house the motors.

Fortunately, modern Allis-Chalmers auxiliary-drive motors need no costly enclosures.

You can count on Allis-Chalmers motors for the kind of operation you need for continuous power generation . . . because A-C has the experience essential to designing and building motors for outdoor use.

For many years, A-C has been supplying splash-proof motors for a variety of outdoor applications. Since 1946, *tube-type* totally-enclosed fan-cooled motors have been available for operation under the most severe conditions indoors or out. And Allis-Chalmers is now offering *weather-protected* motors especially developed for modern outdoor power plants.

Talk Over Your Needs

All three types are available in sizes and speeds to meet all major auxiliary-drive requirements. Your nearby A-C representative can help you select the motors that will best fit your needs for money-saving outdoor installations. Allis-Chalmers, Milwaukee 1, Wis.

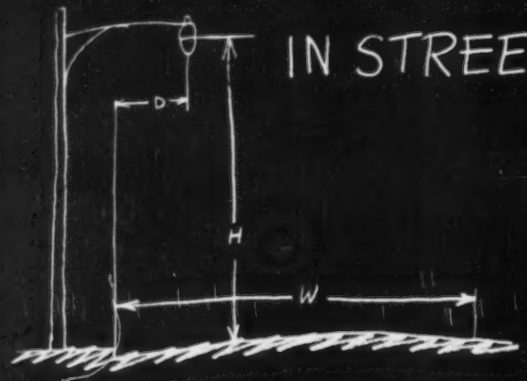
Two 450-hp, 695-rpm, splash-proof cage motors driving induced-draft fans — as well as other Allis-Chalmers auxiliary-drive motors — are installed outdoors at the Natchez Steam Electric Station of the Mississippi Power and Light Company.

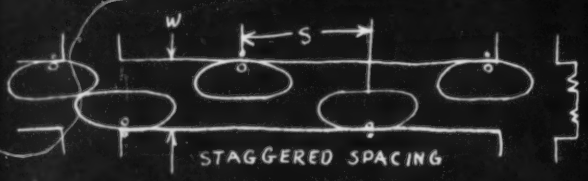
A-3653

ALLIS-CHALMERS

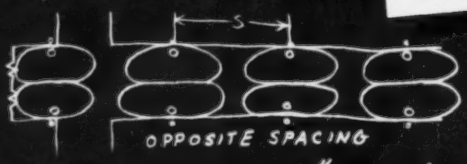
No. 1 in a series

PRACTICAL PROBLEMS TO CONSIDER IN STREET LIGHTING . . . . .





TYPICAL LAYOUTS



Necessary steps in calculating for "maintained" illumination

1. Classify your street:
2. Type of pavement:
3. Illumination values required:
4. Calculation procedure:

$$\frac{\text{spacing between lamp lumens at luminaire} - 70\% \text{ of rated life} \times \text{C.U. of } U \times \left(\frac{\text{luminaire}}{\text{maint. factor}}\right)}{\left(\frac{\text{average footcandles}}{\text{in service}}\right) \times \left(\text{width of roadway}\right)}$$

. . . PROVIDING FOR "MAINTAINED ILLUMINATION"

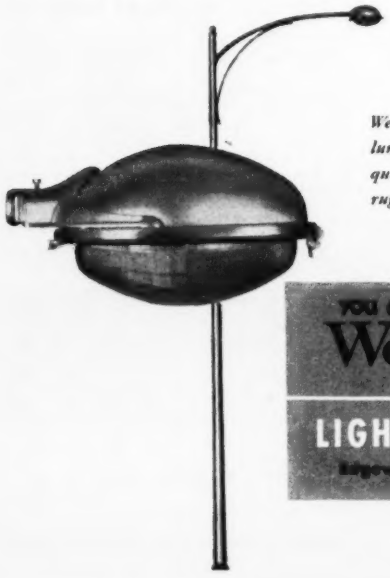
The difference between maintained and initial illumination levels poses a problem: "How much initial illumination is required to maintain proper levels at all times?"

Three important factors must be considered: (1) the illumination value required for the particular projects; (2) lumen depreciation of the lamp; (3) depreciation of the optical system. Initial values should be calculated by using the desired illumination levels and *adding the depreciation factors.*

Westinghouse recognizes your problems in maintaining illumination levels over long periods of time. Providing larger luminaires, for cooler lamp operation and better lamp lumen maintenance, using heavier gauge material, for better mechanical construction and better reflection surfaces, is only part of our program to give you the best.

For practical engineering help in solving these problems, send for the new Street Lighting Engineering Handbook, B-5460 . . . or ask for reprints of this series of advertisements, Westinghouse Electric Corp., P. O. Box 868, Pittsburgh 30, Pa. Consult with us at any time on any phase of a street lighting problem.

J-04309



Westinghouse OV-20, mercury-vapor luminaire, economically provides adequate illumination. Weatherproof and rugged . . . minimizes maintenance.

YOU CAN BE SURE...IF IT'S

Westinghouse

LIGHTING DIVISION

Edgewater Park, Cleveland, Ohio

HIGHER PUNCTURE VOLTAGE VALUES WITH

VICTOR PURIFIED PORCELAIN

VICTOR NO. 900
SUSPENSION INSULATOR

Laboratory tests prove VICTOR *PURIFIED* PORCELAIN has 18% higher mechanical impact values, an improvement of 24% in the range of M & E strength values and oil puncture values that are remarkable (See charts at right!)

Secret of VICTOR *PURIFIED* PORCELAIN is the removal of mineral salts from water used in processing. Years of research in this field have reduced fluctuations in shrinkage and density and practically eliminated the formation of microscopic, glass-like impurities which, up to now, have prevented attainment of maximum strength and hardness. Result—the finest insulator porcelain ever made!

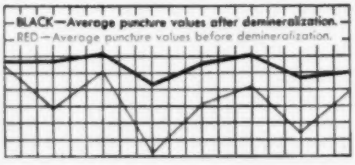
VICTOR INSULATORS, INC. • VICTOR, N. Y.

Specify VICTOR SUSPENSION INSULATORS

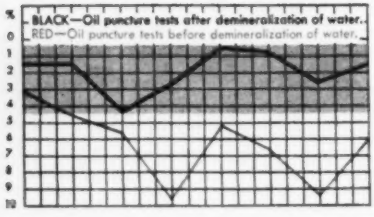
HERE'S PROOF!

Shown below are records of tests made on VICTOR 10" 15,000 lb. Suspension Insulators picked from production runs. These charts show test results of puncture under oil before and after demineralization of water. The first shows average puncture values of tests made and reveals a 7½% increase of average puncture values after water demineralization. The second shows percent average deviation of puncture values.

TEST RUNS OF PUNCTURE UNDER OIL



Average Puncture Values of Tests Run



Percent Average Deviation of Puncture Values

Who put the windows in Bus Conductors?

The **"windows"** are ventilating holes which Chase engineers put in to aid the dissipation of heat. They increase the current carrying capacity about 20% over unventilated tubes. And a ventilated square tube bus conductor means saving up to 36% in the weight of copper used.

When you add to this high mechanical strength, ease of assembly and erection and resistance to corrosion, you'll agree that Chase square copper tube conductors are ideal. Write Dept. EW 352 for the Chase Bus Conductor Handbook.

Chase BRASS & COPPER

WATERBURY 20, CONNECTICUT • SUBSIDIARY OF KENNECOTT COPPER CORPORATION

• *The Nation's Headquarters for Brass & Copper.*

Albany†	Cleveland	Kansas City, Mo.	New York	San Francisco
Atlanta	Dallas	Los Angeles	Philadelphia	Seattle
Baltimore	Denver†	Milwaukee	Pittsburgh	Waterbury
Boston	Detroit	Minneapolis	Providence	
Chicago	Houston†	Newark	Rochester†	(Tube sales office only)
Cincinnati	Indianapolis	New Orleans	St. Louis	

OZ SERVICE TAP

better from every angle

HUSKY CONSTRUCTION WITH COMPACT DESIGN
CASTING SWIVELS FOR EASY INSERTION OF CONDUCTORS
BODY AND CAP INTERIOR SURFACES ARE SERRATED TO ASSURE POSITIVE GRIP
ROUNDED EDGES PERMIT EASY TAPING
RETAINING WASHERS KEEP BOLTS IN PLACE... KEEP TAP ASSEMBLED WHEN CLAMP IS OPEN

The O.Z. Service Tap is cast of high strength copper alloy particularly suited for heavy-duty service connections. Two standard hex head cap screws exert high clamping pressure for low resistance connections. O.Z. bonus features guarantee service and satisfaction. And remember—O.Z. costs no more!

Available in sizes from #2 to 1000Mcm (Main) #10 to 1000Mcm (Tap). Can be furnished with spacer if desired for separating individual conductors. Will take two maximum size cables or one maximum and one smaller size. Excellent for dead-ending wires.

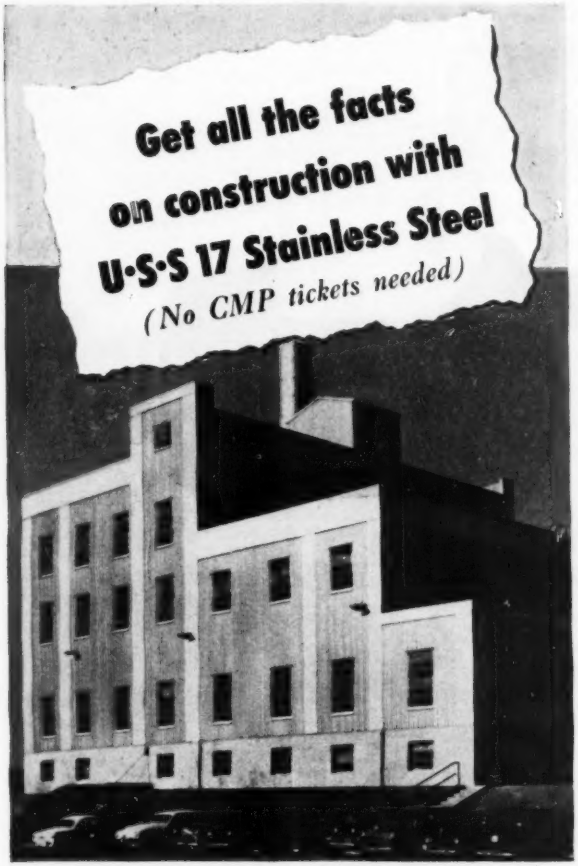
Buy O.Z. and you'll see why Engineers say, "They're OK if they're O.Z."

O.Z. ELECTRICAL MANUFACTURING COMPANY, INC.
262 BOND STREET · BROOKLYN 2, N. Y.

- CONDUIT FITTINGS
- CABLE TERMINATORS
- CAST IRON BOXES
- SOLDERLESS CONNECTORS
- POWER CONNECTORS
- GROUNDING DEVICES

7604

Planning a new building?



THIS POWER STATION makes use of Stainless Steel wall panels. It is owned by Northern States Power Company and is located at Minot, N. D.

WHETHER it's a power plant, an office building or any other type of utility structure, Stainless Steel walls and roofs have *more* to offer you today than other materials for this application.

durable

Stainless Steel's corrosion resistance makes it ideal for buildings that must go up and stay up. In highly corrosive atmospheres where ordinary roofing materials lasted only two years, Straight-Chromium Stainless sheets have been found mechanically sound after 25 years of service.

economical

From the cost standpoint, Stainless Steel is competitive with masonry walls, initially as well as in the long run. And because it requires no maintenance, cost-per-year is much lower than that of masonry or other materials. Stainless Steel's greater strength permits the use of lighter gages and, therefore, lighter supporting members, further reducing the initial cost of the building. Fast, all-weather erection and simplified construction are other practical reasons for choosing this material.

available

Most important of all today, the grade of Stainless Steel suited for this type of application is available now without CMP tickets. It is U·S·S 17 Stainless Steel. Its use is described in detail in our new booklet on this type of construction; use the coupon below to obtain your copy.

AMERICAN STEEL & WIRE . . . . COLUMBIA-GENEVA STEEL . . . . NATIONAL TUBE
TENNESSEE COAL & IRON . . . . UNITED STATES STEEL SUPPLY, WAREHOUSE DISTRIBTUTORS
Divisions of **UNITED STATES STEEL COMPANY, PITTSBURGH**
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

U·S·S STAINLESS STEEL

USS

United States Steel Company
Room 2801 J, 525 William Penn Place
Pittsburgh 30, Pa.

☐ Please send me your booklet "U·S·S Stainless Steel for Walls and Roofs of Industrial Buildings."

*☐ Please arrange to have your customers send me literature on their particular type of Stainless Steel roof and wall panels.

Name ..... Title .....

Address .....

City ..... State .....

**United States Steel is the producer of U·S·S Stainless Steel sheet and strip, not a maker of formed roof and wall panels. These are now being manufactured by a number of our customers.*

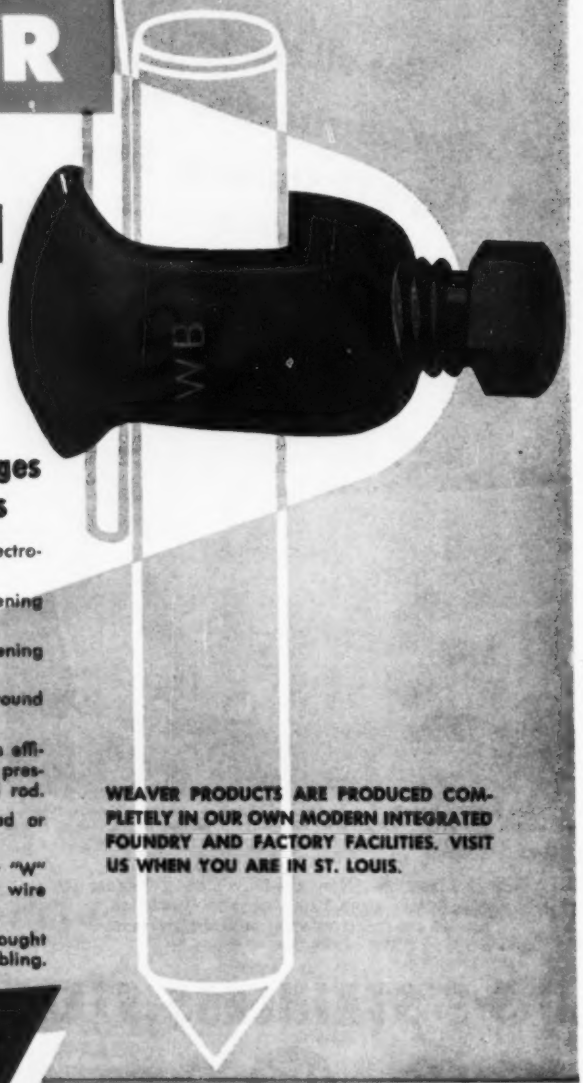
2-472

UNITED STATES STEEL

count these extras in...

WEAVER

cast ground rod clamps



8 Outstanding Advantages ...Competitive Prices

- Cast in our own modern foundry of electro-bronze for highest tensile strength.
- Clamps will withstand maximum tightening torque without breaking.
- Electro-bronze eliminates stretching, loosening and season cracking.
- Design assures perfect alignment of ground rod and ground wire.
- Free running threads on duronze screws efficiently convert tightening torque to high pressure contact between ground wire and rod.
- Screws furnished in either square head or socket set screw type.
- Available in "WB" series or in heavier "W" type for greater strength and longer wire bearing surface.
- Clamps have finished appearance brought about by careful grinding and water tumbling.

WEAVER PRODUCTS ARE PRODUCED COMPLETELY IN OUR OWN MODERN INTEGRATED FOUNDRY AND FACTORY FACILITIES. VISIT US WHEN YOU ARE IN ST. LOUIS.

J. A. WEAVER Company

2110 HOWARD ST. • ST. LOUIS 6, MO.

TELEPHONE CEntral 0881

NEW, NOVEL LIGHT BULB CONTEST TO HELP BUILD EXTRA LOAD

Four-color, full-page ads like this in national magazines and Sunday newspaper magazines.

Once Again Westinghouse Plans Exciting Contest For Power-User Customers

The fun-provoking question asked in the ad to the left will spur millions of power-company customers to buy at least three bulbs to enter the big, new $25,000 Westinghouse light bulb contest. Contest runs from April 21 to June 1. To announce the contest a gigantic advertising program will be run in April and May.

Records on file show that enterprising dealers who tied in with previous Westinghouse contests gained surprising sales increases—in some cases, as high as 200% and 300%. These figures represent undeniable proof why it pays to tie in with Westinghouse light bulb contests.

Plus $5,000 Dealer Display Contest

Your dealers who handle Westinghouse bulbs can compete in a $5,000 display contest running concurrently with the consumer contest. Complete, colorful display material is available. Have your dealers send for this material and tie in for greater profits. More bulbs sold means a sure increase in load . . . sound reason for electric companies to build their Spring promotions around the new Westinghouse contest.

YOU CAN BE SURE...IF IT'S

Westinghouse

FIGURE HOW MUCH TRIPLEX CUTS YOUR COSTS

Specify Kaiser Aluminum Triplex cable instead of conventional open wire construction for distribution lines and service drops and you'll cut costs drastically *—from 20 to 30 percent!*

Because aluminum costs less than copper, initial expense is lower.

Because Triplex is light in weight, with low wind- and ice-loadings, tensions on house and pole are reduced up to 50%. Covering of neoprene or polyethylene resists moisture, abrasion, fungi—will not festoon. Gives much neater appearance—with far less maintenance required.

Send for free booklet giving complete engineering data on new Kaiser Aluminum covered conductor—weatherproof and self-supporting.

Although most Kaiser Aluminum today goes to meet the needs of the national security program, the power industry regularly receives a sizable allocation. What's more, Kaiser Aluminum is expanding facilities to increase its production of primary aluminum 132 per cent! So it will pay you to keep in close touch with your nearest Kaiser Aluminum office, which maintains up-to-the-minute information on current availabilities.

65 Kaiser Aluminum sales offices in principal cities. Or contact our distributors: GE Supply Corporation, Westinghouse Electric Supply Company, Line Material Company, Tafel Electric and Supply Company. Kaiser Aluminum & Chemical Sales, Inc., Oakland 12,

A typical example of cost savings made possible by Kaiser Aluminum Triplex cable is reported from a southeastern city.

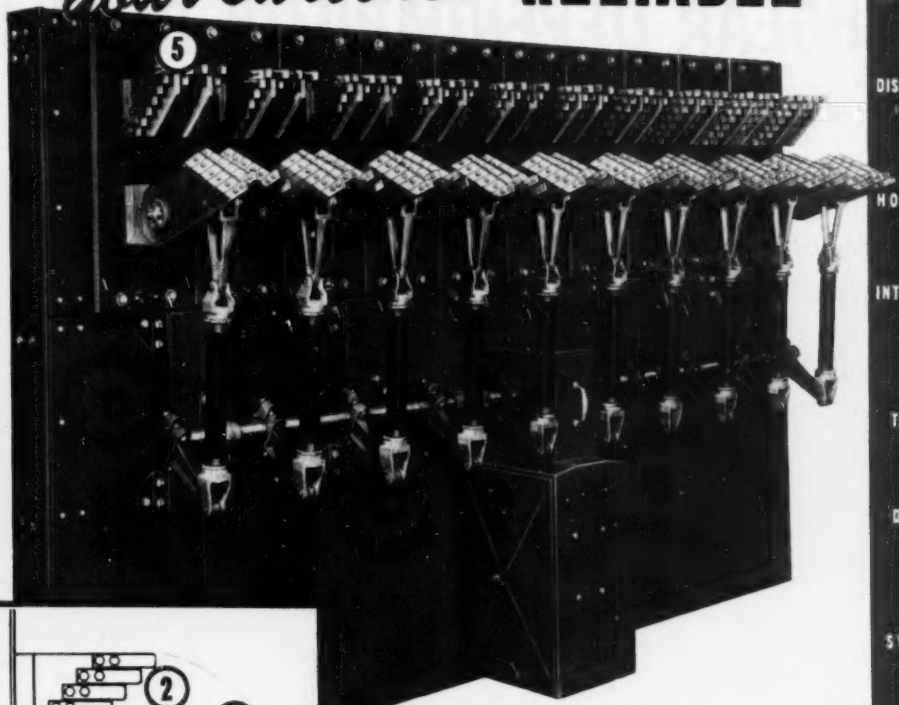
The Cost Comparisons: Copper wire and accessories for 60 feet 3 wire service—$9.30. Triplex cable and accessories for 60 feet—$7.00.

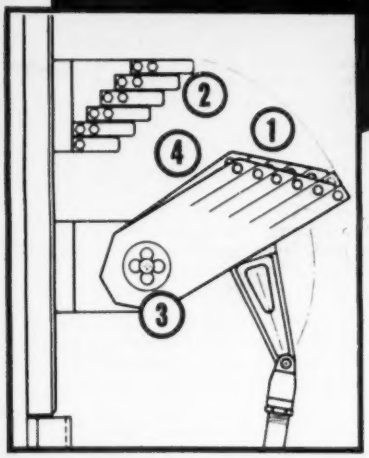
The Saving with Triplex: 24%—plus two-thirds less installation cost!

Kaiser Aluminum

Setting the pace—through quality and service

Because you demand your switches RELIABLE





Drawing above shows a single pole 6,000 Amp. Switch for group operation.

Illustration above shows a special application of ten single pole switches with a total rating of 60,000 Amp. The switch is used to interrupt current and is installed in parallel with a 6,000 Amp. Breaker which remains closed until switch is fully open. When fully open, an auxiliary switch in the operating mechanism trips the breaker. Any slight arcing during transfer of current occurs at the special arcing fingers (5)

This type of installation is ideal for potline switching and reduces the cost of high capacity interrupting equipment.

Check the facts on the

60,000 Amp. Motor Operated HIGH PRESSURE CONTACT SWITCH

1. **HI-PRESSURE SPOT SILVER-TO-COPPER CONTACTS** - self-cleaning with each blade operation.
2. **CONTACT JAW** - Copper tongue and beryllium copper contact fingers - providing high conductivity, together with proper application of strength and resiliency.
3. **HI-PRESSURE HINGE CONTACTS** - uniform pressure in all blade positions through annular, live contact blade surface. Uniform pressure maintained by use of special spring washer with less critical adjustment than ordinary cup spring washer.
4. **EASY BLADE OPERATION** - through sequence blade movement - contact pressure released from inside pair of blades before the outside pair start movement.

I-T-E R&IE

R & I E EQUIPMENT DIVISION

I-T-E CIRCUIT BREAKER CO.

GREENSBURG, PA.

CONDUCTOR SUPPORTS, CLAMPS AND FITTINGS

DISCONNECTING SWITCHES INDOOR AND OUTDOOR

HORN GAP SWITCHES

INTERRUPTER SWITCHES

CUTOUTS AND THERMO-RUPTERS

DISTRIBUTION EQUIPMENT

SWITCH OPERATING MECHANISMS

SUBSTATIONS

OPEN OR ENCLOSED, ISOLATED PHASE HEAVY DUTY BUSES

KIRK INTERLOCK SYSTEMS

AUTOMATIC SWITCHING EQUIPMENT

METAL CUBICLES

TESTING DEVICES

SWITCHGEAR DEPENDABILITY BEGINS

15,000 TO 100,000 AMPERES INTERRUPTING

600 VOLTS A-C, 250 VOLTS D-C

TO 6,000 AMPERES CONTINUOUS A-C OR D-C, TO 10,000 AMPERES CONTINUOUS D-C ONLY

INDOOR AND OUTDOOR EQUIPMENT

When you buy low-voltage switchgear you buy protection for personnel and equipment. Protection against costly production loss if power should be interrupted by a "nuisance" overload. Protection against the expense of ruined equipment, spoiled processes, and the ravages of fire resulting from a short circuit. Only *circuit breakers* can provide this type of protection!

And to those fully familiar with *difficult* circuit protection problems, *circuit breaker* means *I-T-E*. The history of low-voltage-circuit protection parallels the development of I-T-E circuit breakers.

I-T-E Low-Voltage Switchgear takes advantage of every feature of I-T-E circuit breakers. Thus, it provides users with required protection and safety—along with bonuses of convenience and neat appearance. By specifying I-T-E Low-Voltage Switchgear, you know you have specified the finest circuit breaker.

You can get the complete story on I-T-E Low-Voltage Switchgear by writing for Catalog Section 6004. The I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pennsylvania.

Multumite "600" Construction for Types KA, KB, KC and LG drawout air circuit breakers—the combination for complete protection of low-voltage lighting, power, and distribution circuits.

I-T-E

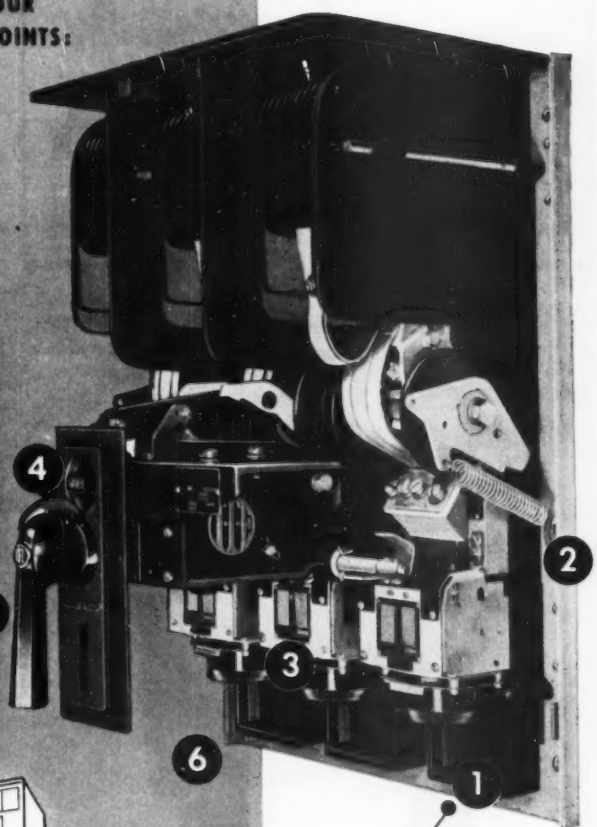
LOW-VOLTAGE

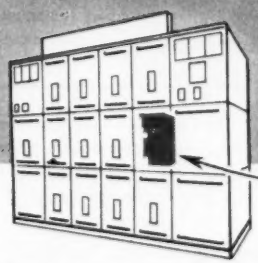
I-T-E CIRCUIT BREAKER COMPANY • 19TH AND HAMILTON STREETS • PHILADELPHIA 30, PA.

WITH CIRCUIT BREAKER PROTECTION!

J-T-E "K" LINE CIRCUIT BREAKERS GIVE YOUR SWITCHGEAR THESE PROTECTIVE STRONG POINTS:

1. Each pole unit is supported in an individual insulating molding. Insulation between adjacent poles is greater than with older, insulated-panel-type breakers.
2. Strong, metal panel provides effective barrier between breaker and bus compartments. Lighter weight allows easier, more convenient breaker handling.
3. Direct acting Inverse-Time-Element overcurrent trip devices are available for every application:
   - Dual thermal-magnetic type—for motor starting, running, and short-circuit protection.
   - Dual magnetic type—for feeder and short-circuit protection.
   - Dual selective type—where coordinated tripping with other protective devices is essential.
4. Position indicator actually protrudes beyond surface of switchgear panel. It is easily visible from any angle.
5. Operating handles are directly connected to breaker mechanism. They are uniform in size, location and appearance in all manually operated breakers.
6. Constructed from unit assemblies, the breakers are easily inspected and maintained. Inventories of small renewal parts are kept to a minimum.





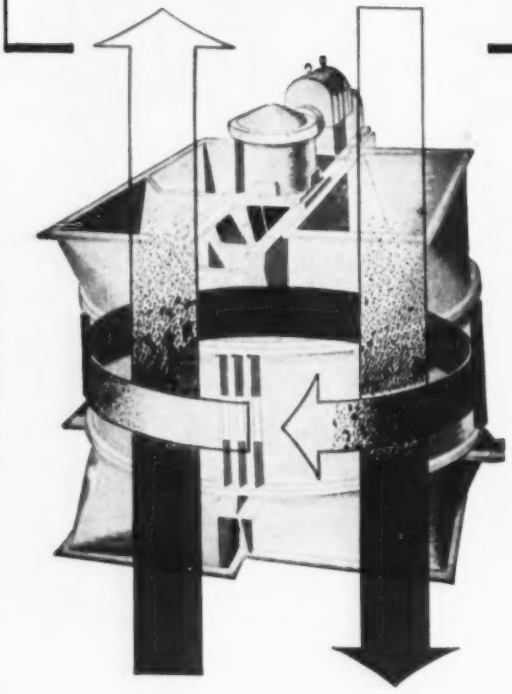
SWITCHGEAR

R&IE Equipment Division: Greensburg, Pa. • Canadian Mfg. & Sales: Eastern Power Devices, Ltd., Toronto • Export Sales: Philips Export Corp., New York 17, N.Y.

more than 285,000,000 lb/hr of post-war steam generating capacity

equipped with *Ljungstrom*

AIR PREHEATERS



Here indeed is impressive evidence of the wide acceptance of the Ljungstrom air preheater. Since the war the total capacity of steam generating units equipped with Ljungstrom air preheaters, installed, under construction or on order in industrial and utility plants throughout the country comes to well over 285,000,000 pounds of steam per hour.

The reasons for the steadily increasing preference for the Ljungstrom air preheater are simple enough. The continuous regenerative counterflow principle assures maximum heat transfer with minimum weight and size. Flexible and compact, it may be used in a wide range of applications. Its proven reliability and low maintenance eliminate costly shutdowns.

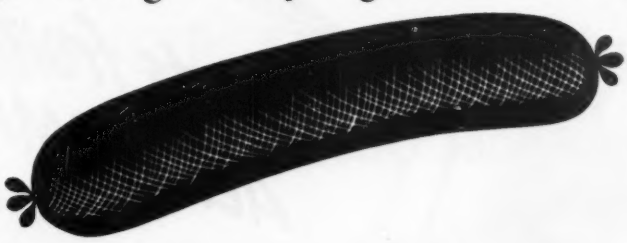
If you are planning to build a new plant or modernize an old one, investigate the possibilities of the Ljungstrom. The specialized experience of Air Preheater engineers is at your disposal, to aid in effecting the most economic heat recovery from flue gases.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

THE AIR PREHEATER CORPORATION

60 EAST 42d STREET • NEW YORK 17, NEW YORK

taking a lot for granted . . .



a hot dog

has a certain shape — a certain outward appearance, but beyond that who knows — like hash

> *"there is mystery in the thunder and in the lightning's flash, there is mystery in everything and there is everything in hash."*

When you need Mica — No substitute will do.

Getting what you ask for . . .

to get the insulation you pay for, to get mica processed to a uniformly high standard of precision and dependability — ask for Macallen Mica — put it into your specifications that way.

when you think of MICA . . . think of MACALLEN

MACALLEN MICA — **THE MACALLEN COMPANY**

ALL FORMS, ALL QUANTITIES — ALL DEPENDABLE

16 MACALLEN STREET • BOSTON 27, MASS.

CHICAGO: 565 W. WASHINGTON BLVD. • CLEVELAND: 1231 SUPERIOR AVE.

Facts from
ALABAMA

"Each 'CSP' Transformer •saves $12.00 load check"

"The 'CSP' Transformer, with the signal light to warn us of overloads, provides an automatic load check. This saves $12.00 to $18.00 in each instance," says an Alabama Utility.

"That's one of the reasons why we have standardized on 'CSP' Transformers for all rural lines. With conventional types, it costs about $6.00 to replace a fuse, and about $12.00 for a load check. Since a blown fuse usually necessitates a load check, the total cost amounts to $18.00. When one considers the large number of transformers on our lines, the unit saving is multiplied many times. In addition, we realize important savings due to ease of installation and low maintenance."

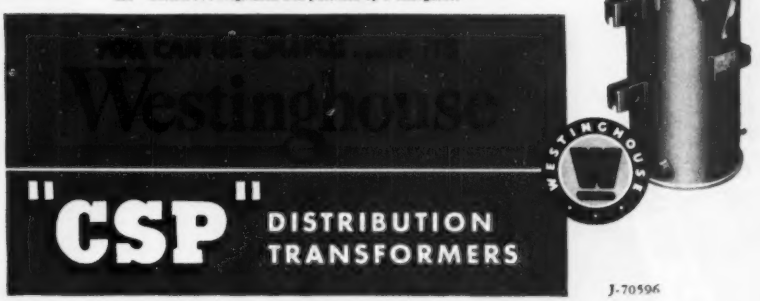
Installation and maintenance costs for Westinghouse "CSP" (Completely Self-Protecting) Transformers are always lower, because complete protective equipment is built in, not separately mounted. A two-year survey of Electric Light and Power Companies shows the following:

NATIONAL AVERAGES

	"CSP"	Conventional
Installation Costs	$13.87	$24.74
Burn-out Rate	0.257%	1.005%
Fuse Outages	None	5.64% @ $6.52 per outage
Load Checks	Automatic	12.8%
Breaker Reset	1.02%	None

If you'd like to check your own costs against these national averages, ask your Westinghouse representative for Booklet B-4247-B, "Transformer Costs and Their Relation to Profits". Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

"CSP" devices . . . originated and patented by Westinghouse



J-70596

"More Power to You".®

through GENERAL CABLE experience
and know-how in the manufacture
and application of...

ALEC

GENERAL CABLE GENERAL CABLE GENERAL CABLE

PIONEERS IN ALU

TRAL

WIRES and CABLES

Twenty years ago, ALECTRAL pioneered the use of aluminum as a conductor for all purposes. The name was assigned to wires and cables of high tensile strength *aluminum*, engineered as solid or stranded conductors for transmission and distribution service.

Today General Cable can supply all types of ALECTRAL, including ALECTRAL-ACSR (bare and weatherproof), ALECTRAL Weatherproof ("O.K.", "Peerless", "Tip-Top" and Polyethylene covered) and ALECTRAL Insulated Service Drop and Entrance Cables.

General Cable manufacturing and field experience with aluminum conductors well qualifies our engineers to offer intelligent and practical counsel to the many who are planning to use aluminum conductor cables on current or future projects.

GENERAL CABLE
CORPORATION

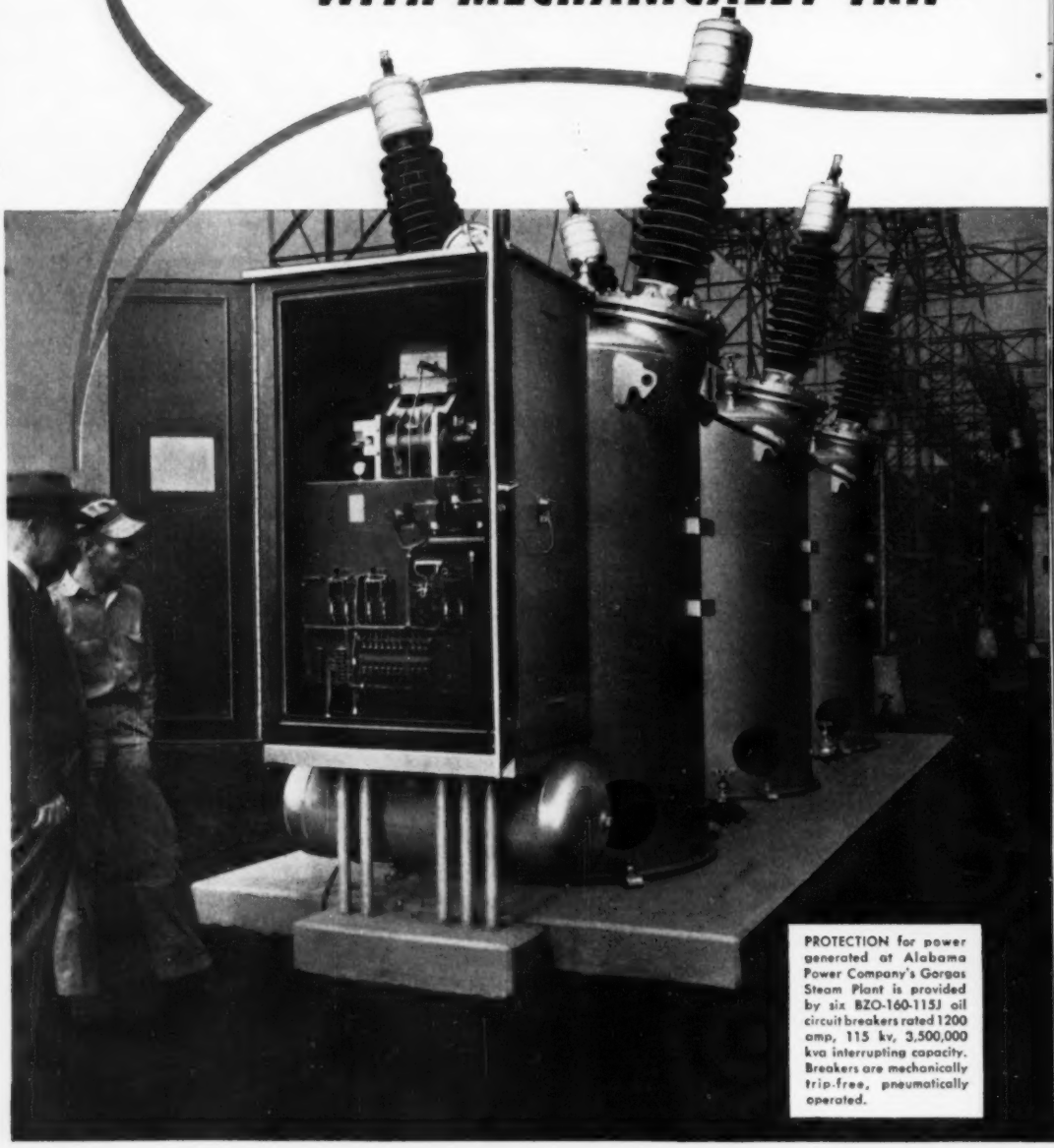
EXECUTIVE OFFICES: 420 LEXINGTON AVENUE, NEW YORK 17, N. Y. • SALES OFFICES IN PRINCIPAL CITIES OF THE UNITED STATES

"ALECTRAL", "O.K.", "PEERLESS" AND "TIP-TOP" ARE REGISTERED TRADE MARKS OF GENERAL CABLE CORPORATION

MINUM WIRE AND CABLE

Fast, Positive

WITH MECHANICALLY TRIP-



PROTECTION for power generated at Alabama Power Company's Gorgas Steam Plant is provided by six BZO-160-115J oil circuit breakers rated 1200 amp, 115 kv, 3,500,000 kva interrupting capacity. Breakers are mechanically trip-free, pneumatically operated.

Performance!

FREE PNEUMATIC OPERATION

ALLIS-CHALMERS

Power OIL CIRCUIT BREAKERS

ELECTRIC POWER is vital today for defense, for industry and to domestic life. Uninterrupted service contributes to continuous production... helps prevent costly shutdowns. Greater concentrations of electric power make it essential that faults be quickly cleared and service instantly restored.

Helping to maintain power stability of systems across the country are Allis-Chalmers power circuit breakers with mechanically trip-free pneumatic operators. These circuit breakers provide:

POSITIVE, HIGH-SPEED OPENING — that's the function of the mechanically trip-free mechanism! Tripping always uncouples contacts from the closing mechanism... powerful accelerating spring, aided by gravity, drives contacts open. All possible drag is eliminated.

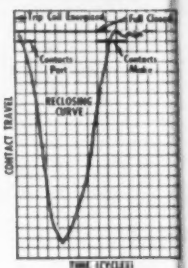
POSITIVE, HIGH-SPEED CLOSING — accomplished with powerful pneumatic operation. Stored energy, enough for at least five closing operations, comes from a self-contained air compressor and tank.

POSITIVE, HIGH-SPEED RECLOSING — provided by the fast coupling action of the mechanically trip-free mechanism and the fast-acting power of pneumatic operation. Meets the power industry's fastest reclosing requirements.

Over ten years' experience in the field has proven the success of mechanically trip-free pneumatic operation for power oil circuit breakers.

For more information on these power circuit breakers, call your nearby Allis-Chalmers sales office, or write Allis-Chalmers, Milwaukee 1, Wis. Ask for Bulletin 71B6022C.

A-3607



MECHANICAL TESTS supplement electrical tests. Mechanical performance is verified by special test equipment. The man on the breaker shown above is checking a special speed recorder called a Speedgraph. With this device contact travel vs time is recorded on a synchronized rotating drum. The graph at right is typical for the first or subsequent reclosures.

ALLIS-CHALMERS

AC ALLIS-CHALMERS

MECHANICALLY TRIP-FREE PNEUMATIC OPERATOR IS STANDARD EQUIPMENT ON ALL THESE ALLIS-CHALMERS OUTDOOR POWER OIL CIRCUIT BREAKERS

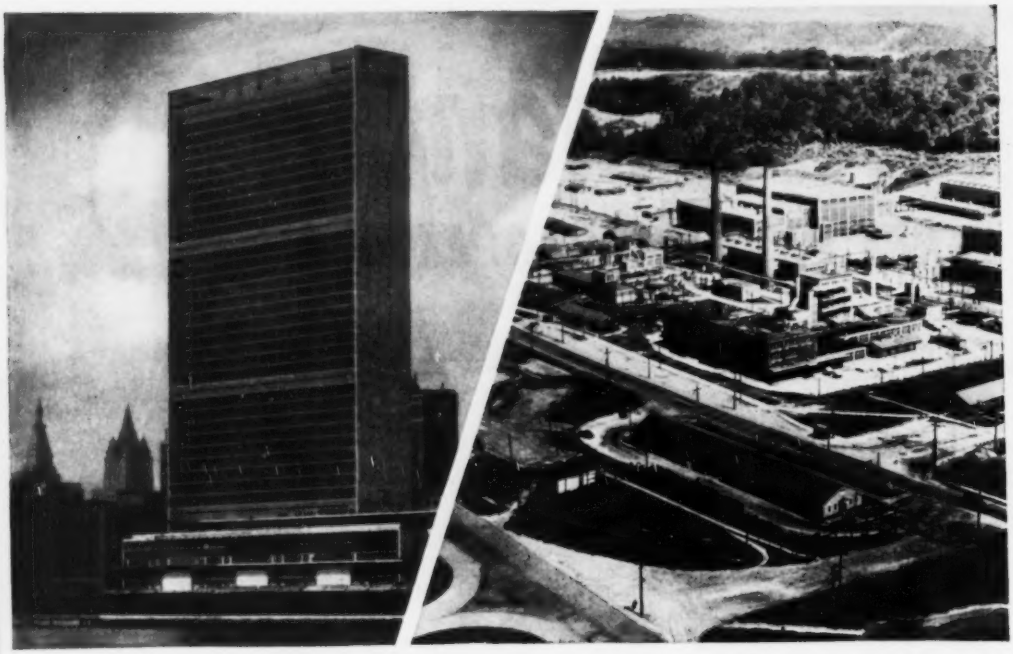
Unitop is an Allis-Chalmers trademark.

Type FZO-150 *Unitop* breaker 14.4 to 46 kv, 8-cycle opening, 20-cycle reclosing*

Type FZO-151 ... 69 kv, 5 or 8-cycle opening, 20-cycle reclosing*

Type BZO-160 ... 69 kv, 8-cycle opening, 115 to 230 kv — 3 or 5-cycle opening with 20-cycle reclosing*

*20-cycle reclosing standard for 600 and 1200 amp breakers



Where History is Made..

THEY USE TRUMBULL PRODUCTS TO DISTRIBUTE AND CONTROL ELECTRIC POWER

Speed of installation . . .

Dependability of performance.

These are the reasons why the builders of Oak Ridge . . . like the builders of The United Nations' new headquarters . . . so often used Trumbull products for distributing and controlling electric power.

In the apartment houses and schools, for example, they used Trumbull load centers equipped with automatic circuit breakers. And in the Atomic Energy Commission plants, they used Trumbull switchboards and motor control centers.

MORE NEWS FROM TRUMBULL

Since the building of Oak Ridge, Trumbull has developed many new products of the same types.

Trumbull's new load center—called Trumbullite—is the first to have plug-in circuit breakers with quick-make, quick-break operation.

And Trumbull's motor control centers are now in the form of CENTR-A-POWER, in which standardized starter-and-disconnect units are grouped in prefabricated, rigid steel troughs, in any arrangement.

What better testimony to product acceptance . . . than to have it adopted where, for peace or war, the atomic energy plant was built . . . and where, for peace, The United Nations is erecting its permanent headquarters?

TRUMBULL (T) ELECTRIC

DEPARTMENT OF GENERAL ELECTRIC
PLAINVILLE, CONNECTICUT

NOW... A NEW VENTED

Full-Circle Venting!

60 to 500 WATTS

Listed by Underwriters' Laboratories, Inc., for Class 1, Group C and D, Hazardous Locations.

- **Greater Safety**
- **Easier To Maintain; Faster To Service**
- **Maximum Lighting Efficiency**
- **Cooler Operating**

Here's the safest explosion-proof fixture ever designed for hazardous location lighting! Exclusive engineering features combined in the new Appleton AA-51 line make these fixtures safer, more efficient, easier to install and maintain—*years ahead of the field!*

AA-51 full circle venting—use of the entire lower edge of the hood as a continuous louvre—is combined with porous metal interiors to provide much more even heat distribution, *definitely cooler operation.* Special shock-absorbing sockets mean a longer useful life for every lamp bulb. And greater light output—proved by lighting curve tests on every wattage—gives you a bonus of extra light for your money every hour the AA-51 operates!

Wire-free canopy construction in AA-51 canopies permits instant removal of the entire fixture! By exchanging a clean, freshly lamped fixture unit for the one taken down, all actual re-lamping and cleaning may be done in safety at the work bench. No juggling of separate parts while perched on a ladder! Canopies themselves—including ceiling types and long and short bracket types—are standardized, will take any fixture in the AA-51 line, 60 to 500 watts, without rewiring. To safely confine arcs, should current accidentally be left on while removing fixture, five full threads on canopy are engaged whenever contact is made or broken!

The ALL-NEW

APPLETON AA-51 SERIES

EXPLOSION-PROOF LIGHTING FIXTURE

1. Standardized Canopy
2. Connecting Block with Spring-leaf Contacts
3. Release lug for easy fixture removal
4. Shock-Absorbing Socket
5. Porous Metal Interiors
6. Notches provide screw driver leverage in releasing globe ring
7. Heat and impact-resisting Glass Globe
8. Detachable Reflector

Sold Through Electrical Wholesalers

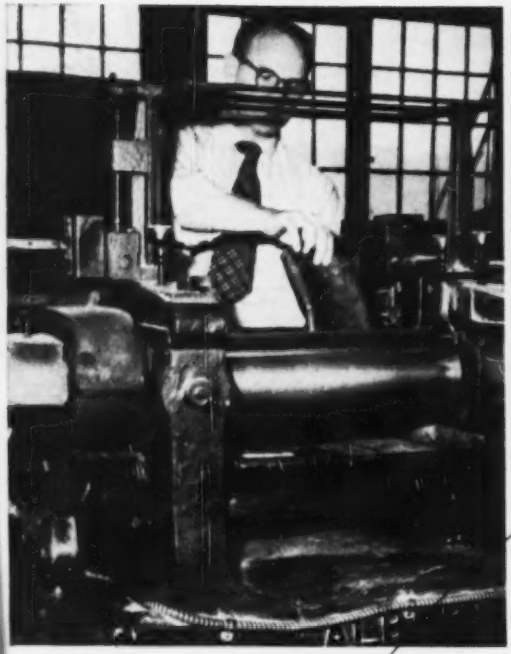
APPLETON ELECTRIC COMPANY

1705 Wellington Avenue • Chicago 13, Illinois

Field Engineers: NEW YORK, 50 Church St. • DETROIT, 3049 E. Grand Blvd. • CLEVELAND, 1836 Euclid Avenue • SAN FRANCISCO, 655 Mimna St. • ST. LOUIS, 227 Frisco Bldg. • LOS ANGELES, 100 N. Santa Fe Ave. • ATLANTA, 724 Boulevard, N. E. • BIRMINGHAM, 809 Brown-Marx Bldg. MINNEAPOLIS, 305 Fifth St., S. • PITTSBURGH, 414 Bessemer Bldg. • BALTIMORE, 100 E. Pleasant St. BOSTON, 10 High Street • DENVER, 1921 Blake Street • PHILADELPHIA, 2013 Locust Street CINCINNATI, 608 American Bldg. • HOUSTON, 717 M. & M. Bldg. • HAVANA, Cuba, Malecon No. 9 BINGHAMTON • DALLAS • INDIANAPOLIS • KANSAS CITY • ORLANDO • MILWAUKEE NEW ORLEANS • SEATTLE • PORTLAND, ORE.

Export Representatives: International Standard Electric Corp., 67 Broad St., New York 4, N. Y.

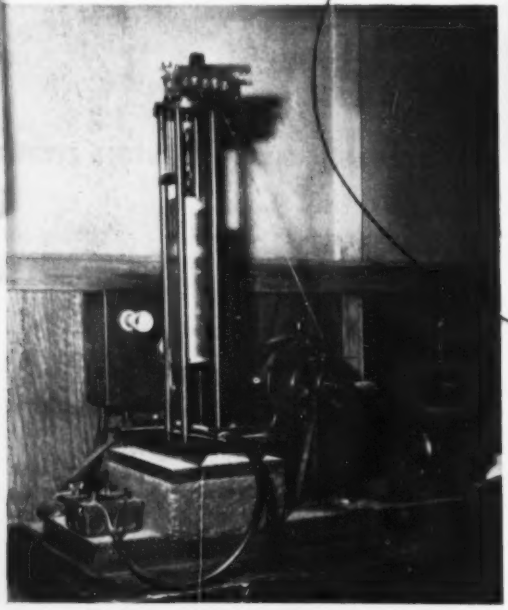
APPLETON ELECTRIC PRODUCTS



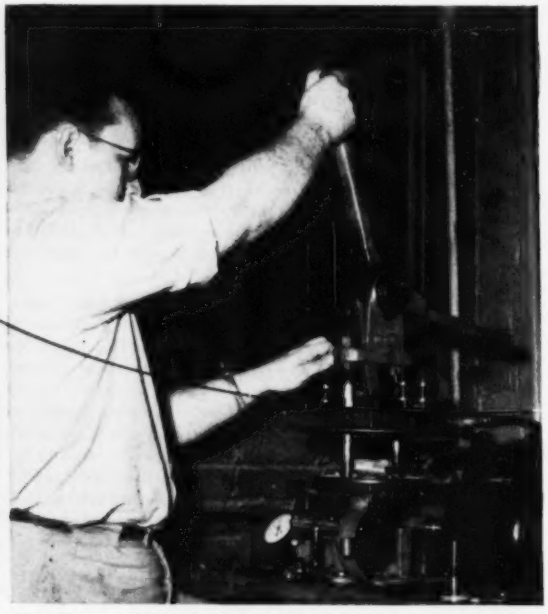
This rubber mill is installed for the exclusive use of our research department. Here, sample rubber compounds are milled under conditions that are identical with those encountered in actual production.

Here are

Here is the oxygen bomb—installed to provide accelerated aging test data. Results are available for all American Rubber Insulations that are tested in the oxygen bomb.



In this drop tester, the cable is operated under full load. The heavy steel weight is repeatedly dropped on the cable until it fails. At the top of the column is a counter that gives a numerical indication of how much such abuse the cable can withstand.



This Viscometer is one of the main tools for maintaining quality control *on the production line*. Rubber samples from every batch are carefully examined to make sure that they meet all specifications drawn up by the research department.

6 answers to your rubber insulation problems

AMERICAN STEEL & WIRE DIVISION
USS
AMERICAN ELECTRICAL WIRE AND CABLE
UNITED STATES STEEL

1. AMARINE-40	**UNDER GROUND OR UNDER WATER.** High voltage service for submarine power cables and for general use above 7500 volts.
2. AMERZONE	**OZONE-RESISTANT.** Plus resistance to heat and moisture.
3. AMARINE RWS	**HOT OR DAMP LOCATIONS.** Low water absorption, excellent heat resistance.
4. AMERITE	**GENERAL USE.** Performance grade compound. Use where copper temperature will not exceed 60°C.
5. AMPEROX	**HEAT-RESISTANT, GENERAL USE.** For copper temperatures up to 75°C., and voltages up to 7500.
6. AMERPRENE	**OIL, FLAME, SUNLIGHT AND AGE-RESISTANT.** Extra flexible jacket. High Neoprene content.

Close laboratory control assures you the best in material and design

There's an AMERICAN insulation for every need

No matter what your problem—high voltage, temperature, oil, moisture, ozone or sunlight—there's a standard American Insulation to solve it.

For complete test data on any of these compounds, call your American Steel & Wire Division District Engineer or write to American Steel & Wire Division, Rockefeller Building, Cleveland 13, Ohio.

AMERICAN STEEL & WIRE DIVISION, UNITED STATES STEEL COMPANY
GENERAL OFFICES, CLEVELAND, OHIO

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS · TENNESSEE COAL & IRON DIVISION, FAIRFIELD, ALA., SOUTHERN DISTRIBUTORS
UNITED STATES STEEL EXPORT COMPANY, NEW YORK

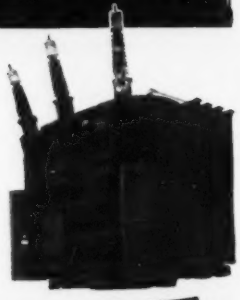
U·S·S American Electrical Wire and Cable

USS

UNITED STATES STEEL

for *Power Transformers* of *Superior Performance*

WHEN you specify **Moloney Power Transformers you are** specifying *"superior performance."* **For over 50 years Moloney has been accumulating experience, skill and facilities to make this possible. You will know beforehand that from your Moloney Transformer, which can be test-proved on our 3,600,000 volt Surge Generator, you can expect *better* performance, *greater* reliability and *less* maintenance expense.**



MOLONEY ELECTRIC COMPANY

Manufacturers of Power Transformers • Distribution Transformers • Load Ratio Control Transformers Step Voltage Regulators • Unit Substations

MOLONEY ELECTRIC = BETTER PERFORMANCE, GREATER RELIABILITY, LESS MAINTENANCE

SALES OFFICES IN ALL PRINCIPAL CITIES • FACTORIES AT ST. LOUIS, MO. AND TORONTO, ONT., CANADA

EDITORIALS

Something to Think About

The rapid increase in residential use of electricity in recent years is a fact known throughout the industry. Not so well known, except to those immediately concerned, are a couple of related facts. One is that distribution facilities may not be keeping pace with growth of residential load. The other is that residential rates are generally of a form and at a level that were designed for a much smaller average residential load than now exists.

These facts are not being neglected by intelligent utility management. They are receiving attention in terms of the long view. What is not being appreciated, we believe, is the possibility that they may become pressing problems much sooner than is anticipated.

The recent and continuing rapid growth of the residential load is a phenomenon, in the sense that a phenomenon is a thing unknown in past experience. This load is growing, not in a constant geometric ratio, but in an increasing ratio. Fourteen years ago, average annual residential use of electricity was about 6% higher than in the year before (1938/1937). Today, the ratio of increase is over 9% (1951/1950). And there is every indication that this acceleration of increase may continue.

For evidence of this one needs only to look at the present array of electric appliances. Some of them did not exist 14 years ago, and many had little or no public acceptance. Think of the laundry drier, the automatic washer, the mechanical and the thermal garbage disposer, the dishwasher, the home freezer, the humidifier, the dehumidifier, and the room air cooler—all unknown or little accepted in 1938. Think of the longer established appliances—the range, the water heater, the refrigerator—whose annual production and sale are now many times what they were 14 years ago. And think of electric house heating and its potentiality.

In 1938 the statistician could have figured that, at 6%, average annual residential usage in 1950 would be twice the then amount. But he would have been considerably on the low side—853 kwhr in 1938, 1,830 in 1950. Now he can look at 1951/1950, take 9% as the rate of increase, and come up with around 4,000 kwhr for 1959. If he does, he may be making a much bigger mistake than he would have made in 1938.

We are now living under the pressure of a defense economy whose fullest weight was expected to be upon us this year and next. Now it appears that the heaviest pressure may not come until 1954 or 1955. Who can say positively it will not have been again postponed when those years arrive? Or that the need for it will not then have evaporated?

In the meantime the production of electric appliances continues. In 1950 and early 1951 it was expected they would soon be in short supply. That did not happen. Instead, some appliances are so plentiful that today the trade is scrambling in feverish attempts to head off a wave of price cutting. People are not buying, it is said. But in the long run they do buy. They take the goods that are produced—at cut prices or list prices, they take them.

It is quite within the bounds of possibility that instead of a major decrease in appliance production resulting from the pressure of defense requirements as is anticipated, there may be a continuing increase in such production in the years ahead. And it could be a rapid increase.

Then what will happen to the residential load? The 9% rise of 1951 over 1950 will be replaced by some higher figure, and the upward trend of the load will be steeper than now. In the face of this possibility, no time should be lost in tackling the two problems of correcting residential rates and providing facilities for handling the load.

Whose Electric Bill?

"Whose electric bill are you paying, Mrs Allen?"

"Why, my own, of course! Don't tell me I've made a mistake."

"No, Mrs Allen, you haven't made a mistake. But, did you know you're paying part of another electric bill besides your own? Here's what we mean.

"When you pay your monthly electric bill to CL&P, part of the money goes into federal taxes. And this tax money, in turn, helps support government-owned utilities which provide so-called 'cheap' electric power to people living miles away from Connecticut."

This dialogue is reproduced from a recent advertisement of Connecticut Light & Power Co. It is an important step in bringing to the attention of the people in non-federal-power areas the fact that their money is subsidizing power for other Americans.

There is no doubt that power costs are lower for the 20% of the nation's consumers of electricity served by federal tax-exempt public power. The cheapness is made possible by the taxes paid by the 80% of the consumers served by tax-paying, investor-owned companies, most of whom are not aware that their money is being used to cut the bills of public power customers miles away.

The sooner the private companies make their customers aware of this situation; the sooner opposition to big federal power budgets will grow. And the sooner "cheap" public power and valley authorities will lose their glamour.

Perfect Fuel

No sootblowers, no precipitators or dust collectors, no pulverizers or stokers, no ash disposal, no freight charges on rock and water. That, ruinous as it might be to a big block of equipment makers, is the fond dream of the power plant operator and designer. He comes close to it with oil and gas but is desperately far from it with coal.

That puts a premium on the newer fuels, and the coal industry is awake to its position. The coal companies are going to do something about it because they are engaging, as a first step, in mechanization and automatization of the mining operations. Machines will bite into the wall around the clock and put the proceeds on an automatically loaded and controlled conveyor for delivery to the surface.

A second step could well be preparation at the mine so that nothing but dry combustible would be shipped. How that could be achieved or what it would cost to execute is problematical. In the light of marvels already performed with oil and synthetic resins and about to be performed with taconite and titanium ores why not accept it as feasible for coal?

Before any coal producer will go far with studies of such a possibility, he will want to know how much subsidy he can count on in premium price for a practically perfect fuel. How much could utilities save in maintenance, operating labor, and investment if they had no ash to transport, collect, or dispose of, nothing but a fuel bunker and some burners to worry about. Would the savings justify another $2 or $5 per ton for the coal? Until somebody shows what the upping can justifiably be no one is likely to demonstrate that it is physically feasible. Coal will be here long after oil and gas are exhausted. Coal producers now are not minded to sit around for 15 or 20 years until that starts to happen.

Democracy in AIEE

Democracy is something to cherish in professional spheres as well as to fight and die for in the governmental sphere. Events of the last decade indicate how easy it is for hard-won democracy to be invaded first by bloc-juggling and then by overweening bureaucracy until totalitarianism finally takes over. Parties strive to get into power, stay in power, exercise power, and be powerful. The ruling cliques maneuver to perpetuate their grip on affairs. When one of the select outlasts his usefulness in one berth, he is shortly discovered ensconced in another one elsewhere.

Nothing quite equal to this exists in professional circles, but there is always the risk that complacency will tolerate circumstances that can tend in similar undemocratic directions. Theoretically the nominating machinery provided in the professional society is guarded by the constitution against perversion by designing groups. Actually, as in the political arena, the nominating committees are not wholly free agents. The stage has often been set for them by prior maneuverings. Worse yet, a society that comprises well-defined but differentiated groups is likely to be conducted on a rotational basis. "It is time," the saying goes in politics, for a westerner, an easterner, or a mid-westerner. The parallel as far as the AIEE goes is the well-known sequence of manufacturer, power man, telephone man, professor, and scientist. Study of the incumbents over the years will show few deviations from the cycle.

That complexion is not democracy, however. It is proportional representation on a "you-scratch-my-back" basis. True democracy would ignore the proverbial categories even if the association is structurally compartmented and subdivided to accentuate the distinctions. Electrical engineers can be emancipated from the system if they will insist on it.

A Booklet for Company Presidents

There should be a place on the top of the desk of every electric utility company president for "200 Questions about Your Public Relations." If it did nothing more, this 24-page booklet, published by Central Surveys, Inc, Shenandoah, Iowa, would serve as a constant reminder that the fate of private industry depends upon its retaining public favor and respect.

But staring a president in the face as he makes the many important decisions of the day, the booklet would become a guide that would influence many of his decisions for the better.

The questions in the booklet are intriguing. Practically every move the company can make is covered by at least one question. There are sections on rates, service, company expansion and capacity, company policies and practices as an employer and a citizen, personnel, appliance sales or sales policies, advertising, local issues, cooperatives, rural relations, public power, and valley authorities.

There is no doubt that if utility company executives remember the public when determining their policies they will take the correct steps. This booklet will help them remember.

THE ELECTRICAL WEEK

Featured in the News

Sepa and Georgia Power step up their scrap for customers (p 92) . . . Canadians are building a reactor to produce electricity at Chalk River project (p 93) . . . **CMP may die** next January (p 94) . . . USBR plans to consolidate power facilities in **Colorado-Wyoming** area (p 95) . . . Interior restakes its claim on North Fork of **Kings River** (p 96) . . . Late winter blizzard browns out Cape Cod (p 97) . . . Joint PEA session asks for smaller control **panel instruments** (p 98) . . . Georgia Power asks PSC to rehear rate case after losing bid for $4.3-million increase (p 99).

• • •

Latest from Washington—Interior appropriations bill is nearing a final **House committee vote** with figures a closely kept secret. Best guesses on committee action: New starts will be kept to a minimum. Funds to be knocked out for New England power study. No new transmission line starts for Sepa. Slight cuts in SPA construction funds. Most Missouri Basin transmission starts, including the one into Minnesota, will be deleted. Bonneville may get Baker-LaGrande line, but not the California intertie. Look for some attempt to restrict federal use of power firming facilities . . . **Supreme Court** has agreed to review a lower court decision directing FPC to strike conditions from a transmission line license which would require Idaho Power Co to wheel government power over lines crossing public lands . . . Because of favorable water conditions, Depa revokes **power curtailment order** for Pacific Northwest a month in advance of its expiration date—March 31. However, there is the possibility that a similar order may have to be issued for the area late this year . . . FPC denies a petition for rehearing on its order granting a license to Portland GE for construction and operation of **Pelton Project** on Deschutes River in Jefferson County . . . AEC's Deputy General Manager **Walter J. Williams,** will assume, in addition to his present post, duties of Assistant General Manager for Manufacturing Major Gen Thomas F. Farrell, resigned.

Consolidate Edison of N. Y. plans to overhaul a 160,000-kw turbogenerator at its Hell Gate plant because it failed recently as a result of a short circuit. Job will take about three months. The 23-year-old unit was scheduled to come off the line in June for an overhaul.

Yazoo City PSC unanimously refuses proposal of Mississippi P&L for lease-rental of Yazoo City's power plant.

Because Arkansas P&L did not yet have a written contract with Southwestern Power Administration, Arkansas PSC denies a portion of an application in which company seeks approval to extend a 115-kv line to Blakely Dam where it intends to buy surplus hydro power from SPA.

North Carolina PUC issues order approving new rates for Tide Water area of Carolina P&L which will save customers about $812,000 annually (EW, March 3, p7).

Kentucky House passes bill reducing to a simple majority the number of votes needed in a referendum to get approval of sale of a city-owned utility to a private company in cities of second, third, fourth, fifth, and sixth classes. Present law requires two-thirds' approval.

Inlet P&L, operating in Eastchester area adjacent to Anchorage, Alaska, offers to sell its generating and distributing system to City of Anchorage as the area is likely to be annexed to the city shortly.

Louisiana PSC order rejecting a Gulf States Utilities Co request for 20% increase in rates (EW, March 3, p48) will be used by city of Beaumont, Tex., in studying the local petition for rate hike, but it will not be the only basis for study, Mayor Plummer says. Gulf States' Vice Pres H. C. Leonard reports company will appeal to courts of Louisiana for the increase.

Nine out of ten Washington State residents would be served by public power if Washington WP and Puget Sound P&L properties are acquired by PUD's or municipalities, C. C. Dill, an attorney for three Washington PUD's says.

Kauai Electric Co, Hawaiian Islands, buys distribution system of seven sugar and pineapple companies and will consolidate them with its own system to cover more than half the island of Kauai. Company has no generating equipment but buys 80% of its power from McBryde Sugar Co and the remaining 20% from Kekaha Sugar Co.

Annual Reports-1951—Central Hudson G&E says that in 1952 the company will generate 75% of its power requirements as against only 13% in 1951. The percentage will reach 93% by 1955 . . . **Long Island Lighting Co** reports that all construction expenditures during 1951, together with a short term bank loan carried over from 1950, were financed on a permanent basis . . . **Atlantic City Electric Co** says population of southern New Jersey will increase 51% by 1960 (about 226,000 more people), according to estimates included in a load and growth study made by Gilbert Associates, Inc . . . **Quebec Power Co** reports "electricity rates must be brought into line with today's increased cost of providing the service."

New England Electric System's Pres Irwin L. Moore says repeal of 3⅓% federal sales tax means about 10¢ a common share, but labor costs will rise in 1952.

Congratulations—South Carolina E&G elects **F. R. McMeekin,** formerly operating manager, vice president in charge of operations . . . Pennsylvania P&L appoints **A. D. Root,** formerly vice president and treasurer, vice president, financial . . . Electrical Service League of British Columbia elects **Howard N. Walters,** general sales manager of British Columbia Electric Co, president and **W. W. Foster,** British Columbia Power Commission, vice president.

WASHINGTON COMMENT

JESSE MOCK

Federal agencies in the electric power business are now making their bid for the future. Behind the closed doors of Congressional appropriations subcommittees, the carefully chosen representatives of these agencies plead for funds for the next fiscal year. On their efforts depend the size and work of the agencies for fiscal 1953. Each of these representatives is allotted only a few hours in which to argue for his agency's share of the millions of dollars the federal government will spend on power facilities next year.

It is no wonder then that the agencies give top priority during this period to their fight for appropriations. In some divisions regular work is set aside completely while employees prepare the charts, figures, and text for the drama to be acted out before the Congressmen.

Taxpayer on the Outside . . . The taxpayer who foots the bill for the government's power projects is not even allowed to attend the committee sessions. But from time to time, the appropriations subcommittees release printed copies of these hearings edited for security and grammar.

The first few of these volumes already available indicate the general theme being used by the agencies to eke out their money for next year. Because of their stake in the hearings, agency representatives tend to dramatize their need for money somewhat out of proportion to the actual situation.

Supplying AEC Plants Fashionable . . . This year it seems fashionable to say or imply that a power installation is to be used directly to supply needs of an atomic energy plant. Only when this argument is obviously far-fetched do the agencies content themselves with tying their projects to ordinary defense plants.

Take the case of the Army Corps of Engineers which is asking for money to begin construction of Hartwell Dam on the Savannah River. Asked to justify the need for power from this project, Brig Gen C. H. Chorpening told the subcommittee the power was urgently needed for expanding industries in the area.

"This is particularly true," he continued, "due to the present plans of the Atomic Energy Commission for the construction of the hydrogen energy plant approximately 139 miles below the Hartwell Dam site on the Savannah River which will require approximately one million kilowatts."

Sepa Tells Another Story . . . But at a hearing before another subcommittee, this testimony seems to be largely contradicted by Charles W. Leavy, acting administrator for the Southeastern Power Administration. He inserted into the record a statement based on a letter from AEC which said the Savannah River plant would require no more than 15,000 or 20,000 kw from outside sources. AEC has since concluded a contract for 30,000 kw and indicated the remainder of the power requirements would come from on-site facilities. An AEC source has estimated that total operating requirements for the plant will total about 180,000 kw.

Southeastern Power Administration told a subcommittee that some of its proposed transmission lines might help supply the Savannah River plant, but an explanation of this was deleted from the printed record.

Bonneville Power Administration attempted to justify three of the more controversial Pacific Northwest Power projects by stressing the power needs of the Hanford Atomic Energy Works. Administrator Paul J. Raver told a subcommittee that conferences with AEC had led to three proposals for assuring adequate power for the Hanford Works without impairing service generally in the area.

Raver listed these as (1) The La Grande-Baker transmission line which would tie the BPA System with Idaho Systems, (2) Earliest completion of Ice Harbor Dam, (3) The Bonneville-Central Valley Project intertie.

Testimony of opponents of these federal projects is still to be released by the committees.

TECHNICAL NOTES

ARCHER E. KNOWLTON

Methane gas escapes when coal is mined. If captured it would often prove adequate to meet the power requirements of the mine operation. The British are thinking of a gas turbine for the job.

Mile head will be available from four enlarged lakes to operate the new Reisseck-Krenzeck hydro station in Austria.

Titanium is plentiful and cheap in ore, expensive to extract but has high strength-to-weight ratio, is ductile, hardenable, resistant to corrosion and erosion, and can partially replace the critically short cobalt and columbium.

Caulking of the joints should not be necessary for aluminum building siding if well designed and installed.

Car dumpers should be provided with platforms so that the operator can uncouple the cars with safety.

Soil thermal conductivity may be calculated with fair accuracy even if only the dry density and the moisture content are known.

Sleeve bearings in power plant auxiliary motors are likely to fail unless the couplings are of limited end float design.

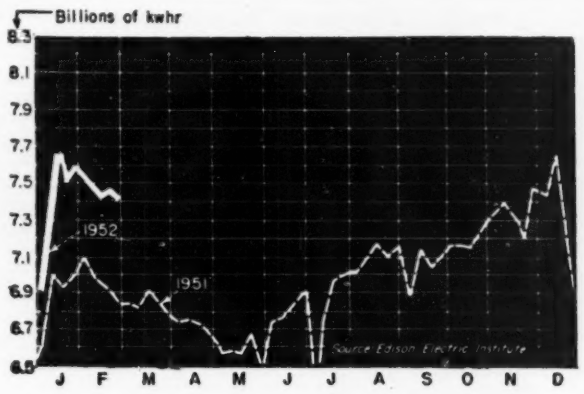
Production line motors in general may not be rugged and durable enough for severe duty in power plant auxiliary service.

River crossings high enough to satisfy U. S. Army Engineers usually involve transmission towers encroaching in the domain of the Civil Aeronautics Administration. Utilities, BPA, and TVA are caught between the (air) devils and the deep blue sea.

Neon lights for transmission towers can be energized inductively without wiring external to the assembly which, incidentally, can be located also at midspan.

Starting-current ratio to running current is about 3½ or 4 to one for hermetic refrigeration motors. Equalized pressures and low inertia contribute to the favorable ratio.

Glass-fiber-reinforced plastic blowers for small fan-cooled motors save aluminum and bronze, are lighter and more resistant to chemicals.



Output Week Ended March 1—7,415,966,000 Kwhr

Per Cent Change From Previous Year

	Total US	New Eng.	Mid. Atlan.	Cent. Ind.	West Cent.	South-east	South Cent.	Rocky Mount.	Pacific NW	Pacific SW
Mar. 1	+8.7	+6.5	+5.1	+5.3	+6.9	+17.7	+19.7	+ 9.4	+6.6	+ 4.8
Feb. 23	+9.2	+3.9	+6.2	+5.8	+6.8	+15.8	+20.0	+12.0	+9.1	+ 8.6
Feb. 16	+7.7	+6.1	+6.0	+4.3	+5.1	+11.2	+17.6	+10.2	+6.9	+10.6

Electric Power Statistics

		Latest Month	Preceding Month	Year Ago
Peak Load (Million Kw)	Dec.	70.5	68.7	62.5
Capacity (Million Kw)	Dec.	75.54	75.18	68.92
Production (Billion Kwhr)	Dec.	33.14	32.10	30.66
Hydro		9.13	8.08	8.69
Fuel		24.01	24.02	21.97
Sales (Billion Kwhr)	Nov.	27.92	27.68	25.39
Residential		7.37	6.85	6.41
Commercial		4.68	4.65	4.21
Industrial		13.89	14.13	12.95
Other		1.97	2.05	1.82
Fuel Consumption				
Coal (Million Tons)	Dec.	9.60	9.72	9.39
Oil (Million Barrels)		6.29	5.95	6.32
Gas (Billion Cu Ft)		52.72	53.70	44.22
Net Income Class A & B Utilities ($ Million)	Nov.	70.81	54.02	65.27
Dec. 52 Peak (Million Kw)*	Dec.	81.1	80.7	75.3
Kwhr per Residential Customer (12 Month Average)	Dec.	2,004	1,988	1,830
Revenue per Kwhr Residential Service (12 Month Average)	Dec.	2.81¢	2.82¢	2.88¢
Canadian Production (Billion Kwhr)	Dec.	5.11	4.94	4.67

Business Statistics

FBR Industrial Production Index†††	Jan.	215*	216	216
Gross National Product Annual Rate ($ Billion)	4th Qtr.	333.0	327.6	303.7
E. W. 5 Industry Production Index	Jan.	125.5	125.0	120.1
ENR Construction Cost Index††	Feb.	115.1	114.8	112.5
BLS Consumer's Price Index	Dec.	189.1	188.6	178.8
NEMA Insulation Materials Sales Index†	Dec.	466	511	564
NEMA Electric Appliance Sales Index†	Dec.	218	269	364
NEMA Household Refrig. Sales Index†	Dec.	115	87	219
Metal Prices				
Copper, Conn. V., lb		$ .24½	$ .24½	$ .24½
Lead, N. Y., lb		.19	.19	.17
Zinc, prime Western E. St. Louis, lb		.19½	.19½	.17½
Tin, Straits, qual. N. Y., lb		1.21½	1.03	1.83
Aluminum, ingot, base price		.19	.19	.19
Nickel, base price		.56½	.56½	.50½
Steel, billets, Pitts., ton		56.00	56.00	56.00
Steel, scrap, No. 1 heavy, Pitts., ton		45.00	45.00	45.00

*Estimated †1936=100 ††1949=100 †††1937-39=100 (Unadjusted)

Wholesale Price Index Completely Revised

The wholesale price index, widely used by businessmen as a barometer of industrial prices and as an aid in contract escalation and forward buying, has been revised. The new index far more accurately measures changes of prices in the nation's primary markets.

The most noticeable change in the index is the increase in the number of commodities priced each month. The new index includes more than 1,900 separate specifications representing transactions aggregating $200 billion. The former index was based on 900 commodities valued at about $80 billion. Electrical machinery subgroup, once represented by two commodities, is now represented by 62 commodities valued at more than $2.5 billion.

"Wholesale," as used in the title of this index, refers to sales in large lots. The price data used in constructing it are those which apply at the first commercial transaction of each commodity.

Electrical Equipment . . . An electrical equipment subgroup contains, in separate product-class series, indexes of the wholesale prices of integrating instruments, motors and generators, transformers and regulators, switchgear and fuses.

An index is, of course, a statistical tool. It measures changes in a series of figures from a base period. The figures in the base period, 1947-1949 in the case of the wholesale price index, are expressed as equal to 100. Any later figure for the index gives you the difference between that period and the base period. The wholesale price index, for all commodities, for example, is now 113.2—or 13.2% above its 1947-1949 base.

In November, electrical machinery and equipment subgroup index stood at 120.4, indicating a 20.4% increase in wholesale prices of electrical products since the pre-Korea base period.

In that month, latest for which product class subgroup indexes are available, the index of integrating instrument prices stood at 120.4, that of transformers and regulators at 116.8, motors and generators 121.8, and switchgear and fuses, 131.3.

Here's the Georgia Power-Sepa Controversy at a Glance:

Following are the main differences between the service contract offered by Georgia Power Co and the "wheeling" contract proposed by Southeastern Power Administration:

Georgia Power Co	Sepa
Customers	
Preference customer would be served by and remain a customer of the company. This would mean company would continue to offer the same cooperation and service customarily extended to customers, including maintenance of customer-owned facilities. Very often small service jobs are now done without charge.	Preference customer would become customer of government with no assurances either contractually or historically as to kind of treatment he would receive. Maintenance would be up to customer.
Excess Requirements	
Company would supply all requirements of preference customer, the excess (if any) over and above that assigned from Clark Hill to be billed at average rate which company's standard schedule for the service, applied to customer's total requirements, would have earned.	It is anticipated the company will supply the excess requirements of the preference customer over and above that available from Clark Hill, but Sepa has no way of making firm commitment on price.
Firming Clark Hill Power	
Clark Hill power would be firmed through integration with the company's system, thus providing over 40% additional firm energy for sale to preference customers.	No parallel.
By-Products	
Company would provide firm market for all by-products of Clark Hill project such as surplus and secondary and peaking capacity.	No parallel.
Delivery and Sale	
Firm marketable power from the project would be delivered and sold to preference customers by company in amounts assigned to each individual customer by administrator, while at the same time providing for direct delivery and sale by government where so requested by the company.	Delivery and sale by government to preference customers over company transmission lines.
Company would establish delivery point for a preference customer for a load of 100-kw demand or more at a point where existing service facilities are adequate, or for a load of 200-kw demand or more at a point requiring construction of some transmission line.	No parallel.
Rates	
Rate for Clark Hill power sold by company to preference customer would be 84¢ per kw month of demand, plus 3.5 mills per kwhr.	Rate for Clark Hill Power sold by government to preference customer would be 75¢ per month per kw of demand, and 4.0 mills per kwhr.

Note: At normal load factors of rural electric cooperatives, the company estimates its proposed rate is 3 to 5% below the rate offered by Sepa.

Battle for Customers Rages in South

Georgia Power Co is determined to keep its hard-won customers, even if it means bringing them government power on a non-profit basis.

Southeastern Power Administration is just as intent on picking off some of the customers, though it may have to charge them more for power.

Congress may go a long way toward determining the outcome of this fight when it finally approves the Interior appropriations bill this year.

Essentially this battle has been waged a number of times before Congress, but probably never on the exact terms that Georgia Power and other members of the Southern Co group are now waging it.

Seeks Funds for Line . . . With the Clark Hill Dam and power plant scheduled for operation this fall, Sepa is asking for approximately half a million dollars to bring power from the dam to a load center near Augusta, Ga. The agency argues that it has not yet been able to conclude a wheeling contract with Georgia Power Co to take the federally produced power to preference customers, and must make some provision for transmitting it. If a contract is not finally agreed to, says Sepa, Congress may have to supply more funds to take the power from Augusta directly to the preference customers.

Harllee Branch, Jr, president of Georgia Power, appeared before a House appropriations subcommittee last month to fight the funds request. He said his company had long ago offered Sepa a contract to get the Clark Hill power to preference customers at highly favorable rates. He called the offer "the most economical and advantageous arrangement for transmitting federal reservoir power to preference customers yet offered to the government and to those entitled to receive the power."

Why, then, is Sepa hesitating?

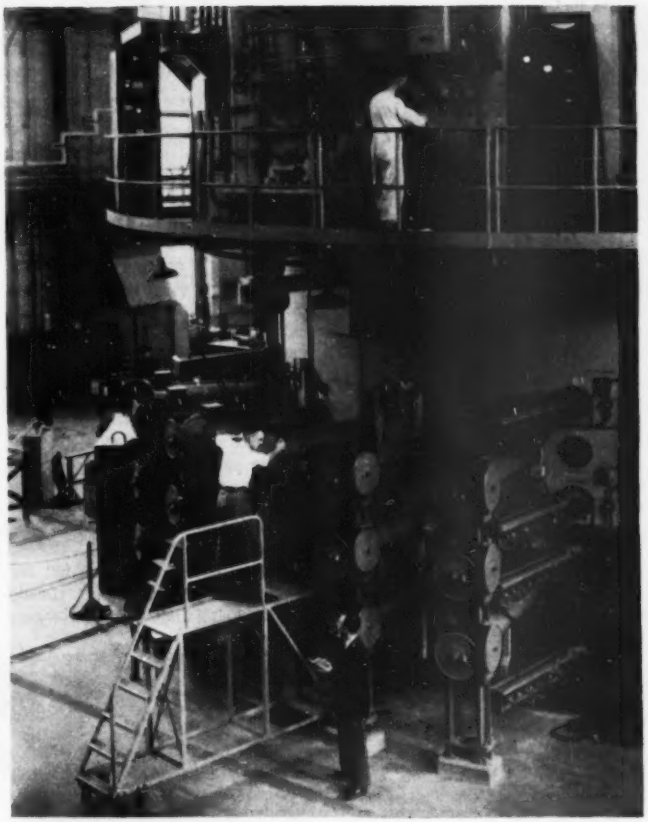
Wants Customers for Itself . . . Simply this: The company offer would permit the preference customer to remain a customer of the Georgia Power Co. Sepa wants the customer for its own, and wants the power company to be a transmission agent for Sepa.

President Branch is well aware that he is taking a big gamble. In an effort to keep his customers, he has offered rates (see box) which he says would not mean any profit to his company for transmitting the government power. He also knows that if Congress makes an appropriation this year for the Clark Hill-Augusta line, it would be committed to run lines from Augusta in the future.

Stakes Are High . . . But Branch considers the stakes worth the gamble: "We consider it very important to us . . . that our customers remain our customers. These customers didn't just happen. They were developed, in many instances, with our assistance. We have over a period of years built up valuable customer relationships with them. We have spent millions of dollars building up their business and building up our service to them."

But Sepa argues that it is trying to carry out the mandate of Congress with respect to the preference clause of the Flood Control Act. Sepa Acting Administrator Charles Leavy told the subcommittee, "We . . . feel that in stating that preference in the sale of such power shall be given to public bodies and cooperatives, Congress intended that these preferred agencies would have the opportunity to buy direct from the government."

Main Issue . . . "The fundamental issue," said Leavy, "is whether the Southern Co group is willing to give those preferred agencies a free choice in selecting their supplier."



ATOMIC REACTOR at Chalk River will be matched by a second to be used to produce power

Canadians Build a Reactor . . .

. . . to produce electricity at Chalk River Atomic Energy Research Project and form a crown company to operate it

Canadian scientists hope to produce power from atomic energy in about two years from a new reactor, the second, being installed at Chalk River Atomic Energy Research Project.

An indication that the new reactor is considered the key to important advances in this field was seen in the recent creation of "Atomic Energy of Canada, Ltd," a government owned corporation that will manage the whole Chalk River operation. Chalk River was formerly run by the National Research Council, which handles all federal research activities.

Crown Company . . . When a governmental operation is about to go into business in Canada and carry on active relations with private industry, normal procedure is to set up a crown company. It remains the property of the government, but its management enjoys the same freedom of operation as does a private company.

That the crown company pattern of organization is being used at Chalk River indicates it is near the point where it will become a commercial operation.

In announcing the move Prime Minister Louis St. Laurent said: "During the past year the design of the new pile has progressed favorably and, of perhaps more importance, the prospects for early and useful application of atomic energy have become more promising. The government now con-

siders that in the light of these facts it is wise to proceed with reorganization immediately in order that a well integrated and experienced management will be working smoothly by the time the new pile comes into operation."

Heads Research . . . Dr. C. J. Mackenzie who, as president of the National Research Council, has headed the atomic energy program, will continue in charge. As of April 1 he will cease to be president of the Research Council and take over the post of president of the new company.

Mackenzie has said atomic power in generating electricity would be in conventional production of steam but that he expects entirely new techniques to emerge which may have as wide ramifications as had the development of the internal combustion engine.

Heavy Water Pile . . . The new reactor will cost the government $30 million, which will nearly double its investment at Chalk River. Like the first reactor which has been operating for some time, it is a heavy water pile. It will be larger than the present installation and will produce greater quantities of power, if apparatus for the control and transmission of the power has been developed by the time it is completed.

C. D. Howe, Canadian defense production minister, plans to invite industrial firms and electric utilities to keep in touch with Chalk River's attempt to harness atomic power. He predicted Canadians may benefit from atomic power in ten years.

In the United States, four power company-industrial company groups have been authorized to work with Atomic Energy Commission in studying the feasibility of generating power from the atom for commercial purposes (EW, May 28, 1951, p 10).

The AEC produced power using heat from an atomic pile at the National Reactor Testing Station, Arco, Idaho, last Dec. 21. (EW, Jan. 7, p 10). Experiments there are continuing.

Bozell & Jacobs Moves

Bozell & Jacobs, Inc, counsel for the Electric Companies Public Information Program, has moved its New York offices to 2 West 45th Street, New York 36, N. Y. The new phone number is MUrray Hill 7-6210.

The End's in Sight for CMP

Washington's metal supply experts say the bulk of controls can come off next January, if no new military crisis pops up. Wilson and Fleischmann still have to give their OK

Barring a new military crisis, you'll probably see the end of the bulk of material controls next January. That's a full year earlier than anyone had expected up to now.

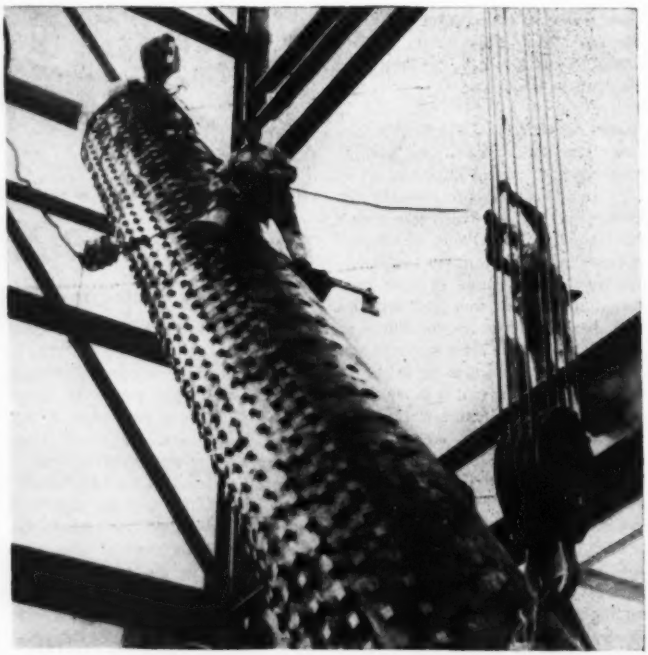
But their top metal experts now are advising Mobilization Boss Wilson and Production Controller Fleischmann that we can ditch the Controlled Materials Plan early next year. They recommend some lesser controls thereafter to give the armed forces the first crack at metals they need—but nothing approaching the present detailed parcelling out of steel, aluminum, and copper for all types of production.

Wilson and Fleischmann haven't formally okayed the timetable for dumping CMP yet. But already they're blueprinting a gradual watering down of material controls during the last half of 1952.

And they've told their top aides: Go slow on government aids for expansion of production of steel and aluminum. The U. S. has already provided for more of those two metals than the military will be able to chew up.

Reason for the switched signals on metal controls is a new report from the Pentagon that estimates long-range metal needs of the military for the recently stretched-out weapon building program. The stretch-out lowered scheduled peak rates for arms production and extended final delivery dates to mid-1955 instead of a year earlier.

Specific figures on military metal needs are secret, of course. But con-



Boiler Going Up

Workmen hoist a giant boiler drum into position at Utah Power & Light Co's Hale steam plant. The plant, part of Utah P&L's five-year, $68-million expansion program, will nearly double the company's capacity.

trols officials now are sure there will be ample steel and aluminum next January for military needs and most civilian uses, too.

Copper and a few other metals, like nickel and cobalt, will still be scarce. So government allocations of these probably will continue to be tough to make sure civilian users get a fair division of what is left after the arms program takes its cut. But even for these metals decontrol is within sight —almost certainly by 1954.

For aluminum and most types of steel the controllers are thinking in terms of a priority system something like that they used before CMP took over. This probably would provide a single DO, or other rating, for military use of steel and aluminum for end items and components.

Continuing shortages of alloying metals—nickel, cobalt, manganese, etc—may call for continued allocations of stainless and other very hard steels. But even these controls will be dropped when military demand for the metals passes the peak—probably sometime next year.

Restrictions on structural steel, up to now the scarcest form of that metal except stainless and plate, also are being eased. The lid will stay on for industrial construction for a while, but only because of the shortage of copper for equipping new plants.

FPC Concludes Survey on Headwater Benefits

Federal Power Commission has closed its investigation of possible headwater benefits to four privately owned hydroelectric projects in the Northwest after finding no evidence of direct benefits.

Projects involved included: Puget Sound Power & Light Co's Rock Island project, Washington Water Power Co's Chelan project, Pend Oreille Mine & Metals Co's Metaline Falls project, and Montana Power Co's Flathead project.

The commission found that none of the projects were directly benefitted by the construction of any storage reservoir or other headwater improvement by another licensee or by the federal government. The investigation covered operations during the period 1931 to the end of 1948, the latest date for which official stream flow records were available when the investigation began in June 1950.

USBR Wants to Integrate . . .

. . . five large projects in the Missouri River Basin-Colorado-Wyoming area by the middle of this year

Consolidation of power facilities of five large Bureau of Reclamation projects in the Missouri River Basin-Colorado-Wyoming area is being proposed to take effect at mid-year.

For the first time, the bureau hopes to integrate completely the power systems of these projects and set up a single marketing and accounting organization to handle power sales. It is the basin account idea except the bureau will continue to repay project costs on an individual project basis.

Projects involved in this proposed power merger include: Missouri River Basin projects, Riverton, Shoshone, Kendrick, Colorado-Big Thompson.

Subcommittee Has Plan . . . The proposal has been put before the House subcommittee on Interior Department appropriations. If it is not disapproved by this group, the bureau hopes no further legislative action will be needed on the proposal.

Under the single power operating and marketing agency procedure, the system will be one consolidated integrated system over which power and energy will flow without regard to project boundary lines. Power operation maintenance and marketing responsibilities for each bureau region will be administered by the regional directors of the respective regions.

In the proposed operation, no accounting for sale to or purchase by individual projects of power from another project would be made. Sale of power to customers of the merged system or purchase of power by the system would be for the account of the operating agent and not from or by individual projects.

Benefits of Merger . . . To a large extent, such an accounting setup would allow the bureau the benefits of basin account system. It would permit the more profitable projects to carry along the less profitable ones.

The bureau plans to make the Missouri Basin project power operating and marketing agent for the system.

Biggest change which would come under the merger would be the accounting and marketing organization. The power systems and generating plants have long been interconnected so that separation of operating activities in many cases have been more fiction than fact.

The merger, argues the bureau, will result in greater economy, efficiency and reliability of operation. One operation and maintenance budget will take the place of the five budgets now used. Furthermore, the merger will give all consumers a postage stamp rate on their power purchases.

Kings River 'Claim' Restaked

Interior is pushing a plan to get all hydro sites on North Fork, including one owned by a private company

Interior Department is restaking its claim on the North Fork of Kings River in California in the hope of getting all its hydroelectric sites—including one already developed by an electric company.

The plan has been sent by Bureau of Reclamation to state and federal officials for review and comment before a final version is submitted to Congress. It contemplates a generation capacity of 350,000 kw at six plants on the river (see map).

These plants include a 45,000 kw installation at Pine Flat Dam now under construction by the Army Corps of Engineers, and acquisition and enlargement to 115,000 kw capacity of the 31,500 kw Balch Power Plant which is owned and operated by Pacific Gas & Electric Co.

Announcement of this new scheme for developing the North Fork, Kings River portion of its huge Central Valley Project, came on the heels of Interior's move to head off private development of another site on the river. In mid-February, the Justice Department, at Interior's request, filed an appeal to revoke the license granted to PG&E by Federal Power Commission to develop a site up stream from Pine Flat Dam (EW, Feb. 25, p 66).

In this latest plan, Interior is not content to head off development by electric companies. It hopes to buy PG&E's Balch Plant at a cost of $16,226,000 and integrate it with its other plants of the Central Valley Project.

This integration would be both operational and financial. The power development revenues would help to retire the cost of the irrigation works that are part of CVP.

Besides Pine Flat and Balch Plants the new plan includes the following projects:

1. Helms Dam and reservoir, on Helms Creek. A concrete dam 320 ft high and 1,000 ft long would provide for storage of 103,000 acre-feet of water, at an estimated cost of $11,540,000.

2. Diversion tunnels to feed water to Helms Reservoir at a cost of $16,060,000.

3. Wishon Dam, reservoir, and power plant at total estimated cost of $26,975,000. Reservoir would have a storage capacity of 128,000 acre-ft and power plant would have a capacity of 10,000 kw.

4. Helms Power Plant, to cost $11,770,000, on the shore of Wishon Reservoir; capacity, 41,000 kw. A 2½ mile tunnel would carry water from Helms Reservoir to power plant.

5. Haas Power Development, on west side of North Fork, 2,000 ft downstream from Wishon Dam. This plant would have an installed capacity of 106,000 kw and cost an estimated $26,975,000.

6. Kirch Power Development, utilizing available drop between the afterbay of Balch Plant and Pine Flat Reservoir. A tunnel would be bored on the north side of North Fork, and a power plant located on the shore of Pine Flat Reservoir. Installed capacity would total 36,000 kw. Cost is estimated at $13,761,000.

Total cost of construction of these projects is estimated at $196,300,000. Interior says this would be repaid to the feedral government with 3% interest from the sale of power developed by the enlarged CVP. After completion of the development, the bureau figures an average commercial rate of 5.2 mills per kwhr for firm energy and 3.3 mills for secondary energy, along with revenue from water sales, would be sufficient to repay capital and annual costs.

Ratio of benefits to cost for the North Fork of Kings River Development is estimated at 1.7 to 1.

REA Approves Loan to Puerto Rico Agency

Rural Electrification Administration is extending its domain by approval of a $6.4 million to a Puerto Rican public agency—the first such loan made to the island.

Puerto Rico Water Resources Authority, an agency of the insular government, plans to use the loan to construct 1,652 miles of distribution line, 50 miles of transmission line, and three substations.

This will allow the authority to increase the number of its customers by nearly 15%—from 190,000 to 218,878.

Of the total number of urban customers on the island, about 80% are served directly by the authority, and the remainder by three other groups.

RECENT STORM in Cape Cod area toppled poles and dragged down lines cutting off power

Blizzard Browns Out Cape

A late winter blizzard struck Cape Cod, Mass., as February bowed out, leaving many residents without power service. The storm was called the worst to hit the Cape in 50 years.

About 25% of Cape & Vineyard Electric Co's customers went without electricity as 20 inches of snow fell. Fierce winds piled it into drifts 6 to 8 feet high.

Principal trouble came from shorted phases on 2.4- and 4.8-kv distribution circuits, caused by conductors whipping in the gales. This blew many fuses. Restoration work was hampered greatly by almost impassable highways.

Practically no trouble was experienced on the 115-kv steel tower lines transmitting energy from the main generating plant of the New England Gas & Electric Association system in New Bedford to Hyannis. Repair crews were rushed into the area from New Bedford and the lower section of Cape Cod around Chatham and Orleans.

The submarine cable line from Falmouth to Martha's Vineyard across Vineyard Sound functioned satisfactorily. As the highway congestion was lessened service was rapidly restored. About 85% of the customers who had been without power had service by nightfall of the second day of the storm and two days later restoration of service was almost complete.

The 22-kv transmission line from Hyannis to the lower Cape suffered little. First estimate of the storm's damage to plant on the NEGEA system was placed at $25,000.

17 U. S. Utility Experts Touring Plants in Britain

Seventeen American utility experts —technicians, engineers, and labor and management representatives— have begun a six weeks' tour of the power facilities of the British Electricity Authority.

The trip is being sponsored by the U. S. Mutual Security Agency and the Anglo-American Council on Productivity. In 1949 British productivity teams visited the United States to discuss power problems.

The group will visit the main centers of transmission and distribution, power stations, and research and educational establishments in England and Scotland. The experts of this country will have a chance to exchange views on such subjects as generation, transmission and distribution, engineering and construction, labor and personnel relations, and commercial practices with corresponding British specialists.

Chandler W. Jones, vice president of Narragansett Electric Co, Providence, R. I., heads the American team.

New Iowa Grid . . .

. . . is forecast at AIEE meeting by N. Bernhard Gussett, president of Iowa P&L

An Iowa transmission grid connecting the major generating facilities of the state was forecast by N. Bernhard Gussett, president of Iowa Power & Light Co, at a recent meeting of the Iowa Section of the American Institute of Electrical Engineers at Des Moines.

Gussett based his prediction on the possibility of "effecting a when-as-and-if interconnection of the major utilities of Iowa." He said he also looked forward to the day when an Iowa "mutual security and economy interchange pool" would come into being.

The model for principal elements of the grid and pool, he said, probably will be the 161-kv line that currently extends from Davenport to Des Moines in Iowa and to St. Joseph and Kansas City in Missouri. A branch of this line reaches to Fort Dodge and Iowa City. It connects units of the Iowa-Illinois Gas & Electric Co, Iowa Power & Light Co, St. Joseph Power & Light Co, and Kansas City Power & Light Co.

A second east-west line, he said, would extend eastward from Sioux City to Waterloo and eventually tie into Dubuque. The lines would separate the state into nearly equal thirds. He said three major north-south connecting lines would probably be needed to complete the grid.

"It is my considered opinion," Gussett said, "that since the majority of the (state's 82 municipal) plants are on, or close to, transmission lines of the investor-owned utilities, the municipalities and the companies should expedite the working out of interchange agreements which are almost certain to work to their mutual advantage."

West Penn Scholarships

The West Penn System again will make available in 1952 two college scholarships, worth $500 a year for four years. The scholarships are available to sons or daughters of employees of West Penn Power, and other subsidiaries, and also to junior employees of these firms. The scholarships were established in 1946 to honor 15 employees killed in World War II.

MEETINGS

Joint Session of PEA Groups . .

. . . calls for smaller control panel instruments with increased visibility and discusses voltage regulating setups

More rational dimensions of mechanical instruments for centralized control boards and the potentialities of today's excitation and voltage regulating schemes were companion symposium themes at a recent joint session of the Prime Movers and Electrical Equipment Committees of Pennsylvania Electric Association in Philadelphia.

Restyling . . . The concentration of instruments in modern power plant control rooms requires smaller recorders of more uniform size and shape, designed to admit light to scales now clouded by glare and shadows, the instrument manufacturers were told by utility and consulting engineers. The instrument symposium was sponsored by W. B. Morton, Pennsylvania Power & Light Co.

Five objectives for power plant instruments were laid down by M. D. Engle, P P & L. They must be: (1) trustworthy, (2) accurate, (3) quick in response, (4) readable at a distance and from a wide angle, and (5) economical of space.

Experimenting . . . D. W. Taylor said Public Service Electric & Gas Co is experimenting with switchboard design in a full scale mock-up to help station operators control generators of 150,000 and 200,000 kw rating efficiently and safely.

Edward Gue, Duquesne Light Co, charged that bulky mechanical devices are wasteful of space on control panels. On boiler, superheater and condensate control panels at Elrema Station, he said, they consumed 50 sq ft of the panel space; electrical instruments 4 sq ft.

R. A. Walton, Philadelphia Electric Co, said that when recorders are placed at eye level on control boards their size determines the panel's length. This reached 31 and 35 ft in two recently built plants.

J. Q. Wray, Pennsylvania Water & Power Co, said tests for the Navy at Johns Hopkins showed horizontal instrument scales are read with less error than sector or vertical scales and that instrument location and benchboard height were other factors affecting reading error.

Much of the discussion of excitation and regulation was on the electronic exciter although papers by manufacturers dealt largely with schemes employing rotating regulators.

For 200 recent General Electric Co turbogenerators, M. Temoshok said, the Amplidyne has had a steady growth—from 40% in 1949 to 75% in 1952 commitments. Such regulation broadens the range of dynamic stability. H. W. Cory said Allis Chalmers was using a transductor in the excitation circuit to measure the field current rather than the exciter voltage, thus circumventing the effects of field heating.

J. E. Barkle of Westinghouse Electric Corp said electronic voltage regulators avoid the dead bank of contact-making types but are only as dependable as the source supplying them. Nevertheless they have inherent inbuilt space capacity.

J. W. Jones reported Philadelphia Electric has voltage regulation on over 2,000,000 kva of capacity and is satisfied with stability performance and ride-through on disturbances.

West Penn Power Co experienced "growing pain" troubles with electronic exciters, the first installed in 1946. "Not enough is known about them," said E. W. Hand, "to warrant complete dependence on them."

CALENDAR

National Electrical Manufacturers Association
Winter Meeting, Edgewater Beach Hotel, Chicago, March 10-13; 4th International Lighting Exposition - Conference, Industrial - Commercial Lighting Equipment Section, Cleveland Auditorium, Cleveland, May 6-9.

National Rural Electric Cooperative Association
Annual Meeting, Conrad Hilton Hotel (formerly Stevens Hotel), Chicago, March 10-13.

National Association of Corrosion Engineers
Annual Conference, Buccaneer Hotel, Galveston, Tex., March 10-14.

Southeastern Electric Exchange
Engineering-Operation Section Conference, Jung Hotel, New Orleans, La., March 13-14; Annual Conference, Boca Raton Hotel, Boca Raton, Fla., April 21-23.

Illuminating Engineering Society
South Pacific Coast Regional Conference, Hotel Sir Francis Drake, San Francisco, March 13-14; Southwestern Regional Conference, Hotel Tulsa, Tulsa, Okla., April 6-8; Southern Regional Conference, Hermitage Hotel, Nashville, Tenn., April 20-22; Canadian National Conference, Hotel General Brock, Niagara Falls, Ontario, Can., April 30-May 2; Great Lakes Regional Conference, Hotel Statler, Cleveland, Ohio, May 5-6; East Central Regional Conference, Webster Hall Hotel, Pittsburgh, Pa., May 22-23; Northeastern Regional Conference, Hotel Preston, Swampscott, Mass., June 19-20.

Electric Companies Advertising Program
Management Meeting, St. Charles Hotel, New Orleans, La., March 14.

Pacific Coast Electrical Association
Operating Economics Section Conference, Hotel California, Fresno, Calif., March 20-21; Administrative Services Section Conference, Los Angeles, April 17-18; Business Development Section Conference, Hotel Huntington, Pasadena, Calif., April 24-25.

A&M College of Texas
Annual Conference for Protective Relay Engineers, Department of Electrical Engineering, College Station, Tex., March 24-26.

American Society of Mechanical Engineers
Spring Meeting, University of Washington, Seattle, March 24-26; Semi-annual Meeting, Sheraton-Gibson Hotel, Cincinnati, Ohio, June 15-19.

American Power Conference
(Formerly Midwest Power Conference)
Sherman Hotel, Chicago, March 26-28.

Oklahoma Utilities Association
Annual Convention, Biltmore Hotel, Oklahoma City, March 27-28.

Tennessee Valley Public Power Association
Annual Meeting, Peabody Hotel, Memphis, Tenn., March 31-April 1.

Edison Electric Institute
18th Annual Sales Conference, Edgewater Beach Hotel, Chicago, March 31-April 3; Electrical Equipment-Prime Movers Committees, Edgewater Beach Hotel, Chicago, May 5-6; Association of Edison Illuminating Companies Meter-Service Committees, Edgewater Beach Hotel, Chicago, May 5-7; Transmission-Distribution Committee, Edgewater Beach Hotel, Chicago, May 6-7; Hydraulic Power Committee, Edgewater Beach Hotel, Chicago, May 6-7; Purchasing Stores Committee, Roosevelt Hotel, New Orleans, La., May 11-14.

Missouri Valley Electric Association
Engineering Conference, Hotel President, Kansas City, Mo., April 2-4.

Indiana Electric Association
Young Men's Utility Conference, Van Orman Hotel, Fort Wayne, April 3-4.

Maryland Utilities Association
Lord Baltimore Hotel, Baltimore, April 4.

American Institute of Electrical Engineers
Southwest District Meeting, Jefferson Hotel, St. Louis, Mo., April 15-17; Welding Conference, Rackham Memorial Bldg., Detroit, Mich., April 16-18; arranged jointly by American Welding Society, Detroit Section, and Industrial Electrical Engineers Society, Detroit; Northeast District Meeting, Arlington Hotel Binghamton, N. Y., April 30-May 2; Summer General Meeting Hotel Nicollet, Minneapolis, Minn., June 23-27.

Pennsylvania Electric Association
Spring Meeting Meter Committee, Hotel Yorktowne, York, Pa., April 17-18; Electrical Equipment Committee, Hotel Roosevelt, Pittsburgh, Pa., May 15-16.

Rocky Mountain Electrical League
Spring Conference, Shirley Savoy Hotel, Denver, Colo., April 20-22.

American Public Power Association
Spring Convention, Hotel Olympic, Seattle, April 29-May 1. Joint Meeting with Northwestern Public Power Association, April 28.

Public Utilities Advertising Association
Annual Convention, Hotel Radisson, Minneapolis, Minn., May 8-9.

C.I.G.R.E.
(International Conference on Large Electric High-Tension Systems). 14th Biennial Session, Paris, France, May 28-June 7.

International Organization of Standardization
Triennial Meeting, Columbia University, New York, June 9-21.

American Society for Testing Materials
Annual Meeting, Hotels Statler-New Yorker, New York, June 23-27.

FINANCIAL

Rate Rehearing Sought . . .

. . . by Georgia Power Co after Public Service Commission denies proposed increase of $4.3 million annually

Georgia Power Co has filed a petition with the Public Service Commission asking a rehearing on its recently denied request for increase in rates to yield $4,275,000 additional revenue annually.

After nine months of argument and deliberation the PSC on Feb. 15 denied the company's request by saying the company is now making a fair profit and is not entitled to an increase. At that time the company's president, Harllee Branch, Jr, said, "We are not only disappointed, but amazed at the action of the commission."

The application was denied principally on grounds that elimination of the 3⅓% federal excise tax on residential and commercial sales and reduction of Georgia's ad valorem tax rate from 5 mills to ¼ mill would save the company $1,627,431.

Higher Expenses . . . The company now insists these changes in tax laws have been more than offset by increases in federal income taxes and a more liberal pension program adopted Jan. 1, 1952. The company also claims the PSC's order failed to grant relief for other increased operating costs.

The PSC has 30 days in which to take action. Chairman Matt McWhorter said the commission will hear the company's petition and then reach a decision in executive session.

"We are in no hurry to decide this thing," McWhorter said. "We are going to take our time, because we want to do the right thing."

Investment in Facilities Up . . . The application for rehearing pointed out that the company since 1949 had invested nearly $45 million in facilities to serve its customers and that proper consideration was not given to this development.

In spite of this increased investment, the company declared, its earnings were about $250,000 less than in 1949.

The petition claimed the PSC did not establish the present value of the company's property, and that such a finding is essential to determine what constitutes a fair return.

Revenues on the Increase . . . The company stated its electric revenues increased 23% from 1949 to 1951 and kwhr sales increased 30%—without corresponding increase in net income.

Greater use of electricity, the company said, has brought a decline of 5.6% in the price per kwhr in the past two years and "a substantial decline" in net revenue per kwhr. The company contended that, because of rising costs, the PSC should halt this trend.

The company has put the PSC on notice that it may submit new evidence for increased rates above the $4.3 million now being asked if there should be a further rise in operating costs between now and rehearing date.

Bill Delays Putting Rate Hikes into Effect

Both houses of the Kentucky General Assembly have enacted a bill under which any rate increases by utility companies must first be approved by the Public Service Commission. The bill passed both houses without a dissenting vote, in the House 75-to-0, and the Senate 35-to-0. Heretofore utilities could post bond and then advance rates to take care of refunds.

The bond provision has been eliminated. Under the new law, which it will be when signed by the Governor, a utility could not put a rate increase into effect for at least five months after application is filed, unless Public Service Commission approved the increase. If the commission reached no decision within five months, the proposed increase in rates could be made effective, but subject to reduction or cancellation by the commission.

The commission would also be permitted to increase assessments against utilities from $130,000 to $250,000 a year to finance increased costs of the commission's operations.

FINANCIAL BRIEFS

Maine Public Service Co stockholders took 29,744 common shares of 35,000 offered on 1-for-5 basis at 15¼ a share via primary rights. Under oversubscription privileges, stockholders asked for 9,084 shares, necessitating allotment.

Kansas Gas & Electric Co is planning to offer securities in the next few months . . . **Wisconsin Electric Power Co** is considering to sell $25 million in bonds this spring . . . **Toledo Edison Co** is planning to sell more common stock later this year with "the amount and timing dependent on earnings and the condition of the market."

Northern Indiana Public Service Co will pay March 20 a common dividend of 38¢ a share to stockholders of record March 5 as compared with 35¢ in previous quarters . . . **Wisconsin Hydro Electric Co** will pay March 20 to holders of record March 7 a common dividend of 22½¢ a share versus 20¢ in previous quarters.

Tudor Engineering Co's report on the value of Pacific Power & Light Co's properties within the district has been completed and will be available and made public shortly, Northern Wasco People's Utility District Pres W. J. Seufert has revealed.

Securities and Exchange Commission has postponed indefinitely the proposal of New England Electric System to sell their gas properties in Massachusetts to a group headed by Lehman Bros. at the adjusted base price as of Oct. 31, 1951 of $23.9 million . . . **Interstate Power Co** has received Securities and Exchange Commission approval to borrow $4.3 million on 3¼% notes from Chase National Bank and Manufacturers Trust Co . . . **Columbus & Southern Ohio Electric Co** is contemplating the sale of new securities in 1952.

Southern Co has estimated it will spend $102 million for construction in 1952 . . . Bank of Montreal-A. E. Ames & Co, Ltd. has sold quickly $50 million **Quebec Hydro-Electric Commission** 4% debentures due 1962 at par.

Today in Utility Finance

YIELDS (%)

Quality	Bonds			Preferred Stocks			Common Stocks		
	1st	2nd	3rd	1st	2nd	3rd	1st	2nd	3rd
DATE									
1952									
Feb. 28	**2.95**	**3.03**	**3.11**	**4.13**	**4.34**	**4.71**	**5.40**	**5.94**	**6.48**
Feb. 21	2.95	3.00	3.11	4.16	4.30	4.73	5.42	5.92	6.59
4th 1951	3.09	3.07	3.21	4.32	4.50	4.91	5.42	6.18	6.84
3rd 1951	2.87	2.91	3.04	4.05	4.27	4.61	5.52	6.24	7.05
2nd 1951	3.09	3.11	3.23	4.11	3.37	4.68	5.73	6.38	7.78
1st 1951	2.87	2.93	3.00	3.96	4.19	4.52	5.47	6.20	7.13

Data: Reis & Chandler, Inc.

EARNINGS

Company	Period Months	Ended	Net Income 1952	Net Income 1951	Earnings Per Common Share 1952	Earnings Per Common Share 1951
California-Pacific Utilities	12	Jan.	$494,492	$520,228	$1.85b	$2.21b
Central Maine Power	12	Jan.	4,488,907	4,305,988	1.42	1.39
Consumers Power	12	Jan.	19,705,205	19,618,532	2.64e	2.86c
Portland General Electric	12	Jan.	3,454,030	3,502,869	2.7C	2.80
Southern Co.	12	Jan.	17,513,152	16,205,508	1.07e	1.06c
Virginia Electric & Power	12	Jan.	10,674,415	10,181,876	1.72b	1.90b
			1951	**1950**	**1951**	**1950**
Boston Edison	12	Dec.	$7,791,597	$7,726,652	$3.16	$3.13
Central Arizona Light & Power	12	Dec.	1,534,697	1,754,511	....	....
Commonwealth Edison—consolidated	12	Dec.	26,754,689	29,129,284	1.93a	2.12
Green Mountain Power	12	Dec.	473,578	391,819	1.95	1.61
General Public Utilities—consolidated	12	Dec.	14,647,641	16,580,075	1.84	2.08

NOTE—Boston Edison and General Public Utilities figures have been audited; those for other companies are preliminary.

a—Adoption of bi-monthly billing in Aug. 1951, resulted in delaying about $5.8 million of gross revenues and thereby reduced net income by about $2.7 million, or 20¢ per share; b—On average number of shares in each period; c—On outstanding shares at end of each period.

FINANCING

Company and Description	Amount of Offering (000)	Offering Price	Yield to Public
WEEK OF FEBRUARY 28—MARCH 5			
Bonds			
Oklahoma Gas & Electric—1st mtg 1982	$12,000	postponed	
Preferred Stock			
Illinois Power—200,000 sh 4.70% $50 par	$10,000	$51.00	4.61%
WEEK OF MARCH 6-12			
Bonds			
Pacific Power & Light—1st mtg 1982	$12,500	.....	.....
Metropolitan Edison—1st mtg 1982	7,500	.....	.....
Potomac Electric Power—1st mtg 1987	15,000	.....	.....
Central Power & Light—1st mtg 1982	10,000	.....	.....
Illinois Power—1st mtg 1982	20,000	.....	.....
Preferred Stock			
Rochester Gas & Electric—60,000 sh $100 par	$6,000	.....	.....
Metropolitan Edison—40,000 sh $100 par cum	4,000	.....	.....
Ohio Edison—150,000 sh $100 par cum	15,000	.....	.....
SCHEDULED FOR MARCH			
Bonds			**Bid Date**
Southwestern Gas & Electric—1st mtg 1982	$6,000		March 17
Pacific Gas & Electric—1st mtg 1985	55,000		March 18
Narragansett Electric—1st mtg 1982	7,500		March 19
Consolidated Edison Co of New York—1st mtg 1982	50,000		March 25
Interstate Power—1st mtg 1982	2,000		March 31
Texas Power & Light—1st mtg 1982	14,000		March 31
Texas Power & Light—debentures 1977	5,000		March 31
Common Stock			
Middle South Utilities—600,000 sh	.....		March 19
Arizona Public Service—400,000 sh	.....		*March 27
Interstate Power—345,833 sh (to be offered commonholders on 1-for-6 basis, record April 4; stockholders allowed oversubscriptions; company will name price with underwriters bidding on compensation)	.....		March 31
Arkansas-Missouri Power Co—18,955 sh (being offered to commonholders on 1-for-19 basis, record Feb. 29 to expire Mar. 17; stockholders allowed oversubscriptions)	$251	$13.25	7.55%
Central Louisiana Electric—53,616 sh (being offered to commonholders on 1-for-7 basis, record Feb. 25 to expire Mar. 31; stockholders allowed oversubscriptions)	1,582	29.50	6.78
Black Hills Power & Light—33,730 sh (being offered to commonholders on 1 for-6 basis, record Feb. 28 to expire Mar. 13; stockholders allowed oversubscriptions)	599	17.75	7.21
Texas Utilities—409,680 sh (being offered to commonholders on 1-for-12 basis, record March 5 to expire March 28; stockholders allowed oversubscriptions)	13,315	32.50	5.17

* To be offered by First Boston Corp group, underwriters.

Sho-Me Power Proposes to Sell Portion of System

Sho-Me Power Corp, Marshfield, Mo., has asked Public Service Commission approval to sell two sections of its distribution system. The sections are:

1. Some 38 miles of distribution lines to Ozark Border Electric Cooperative of Poplar Bluff, Mo. It would include the power system in Neelyville, Oxley, and West Doniphan and the base sale price would be $101,717, an amount Sho-Me owes the federal government on a Rural Electrification Administration loan.

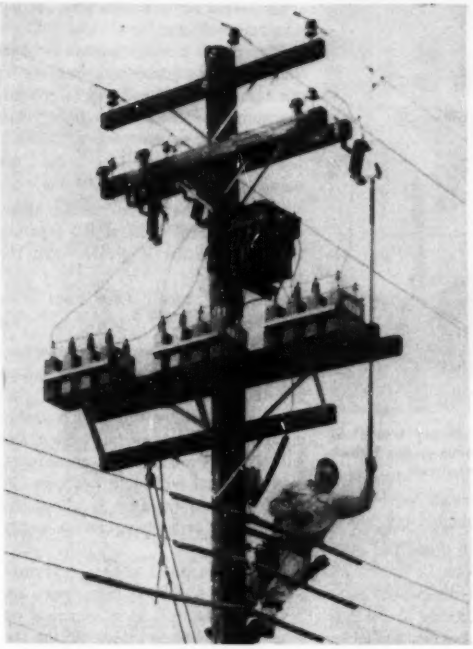
2. About 36 miles of lines in Webster and Wright counties, including power systems in Mansfield, Seymour, and Norwood to Se-Ma-No Electric Cooperative, Mansfield, Mo. The purchase price would be $158,196, also the amount of a loan owed to the federal government.

REGULATION

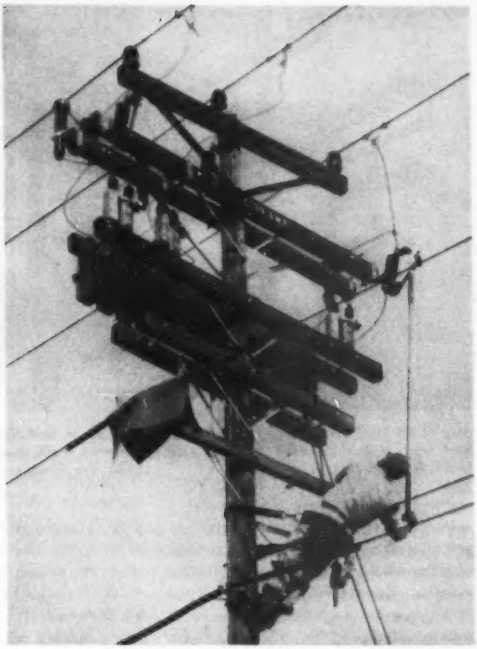
Otter Tail Power Co has asked North Dakota PSC to increase rates by an estimated 6% to yield about $300,000 annually in North Dakota. If these increases are granted, the company is planning to put the new rates into effect in Minnesota and South Dakota as well.

Ontario Hydro-Electric Power Commission's Chairman Robert Saunders has told a joint meeting of the Ontario Municipal Electrical Association of Municipal Electrical Utilities that he believes "no general increase in rates to municipalities will be necessary" in 1952. He said that steam power would be used in tremendous amounts by the end of this year. "I cannot promise that we shall be able to maintain present interim rates when forced to use steam power," he declared. He said changeover to 60-cycle in the 25-cycle island of Ontario was one-fifth complete.

Idaho Power Co's Pres T. E. Roach has told New York Society of Security Analysts that earnings are estimated at not less than $2.40 a common share on 1,125,000 shares to be outstanding after the company's schedule of 225,000 more shares are sold this summer. Company will spend about $9.8 million in 1952.



SINGLE POLE switched capacitor installations are all of 300-ckva capacity, in this case 3-phase, 4-kv wye



THREE-PHASE, 12-kv wye capacitor bank of 300-ckva capacity installed on a single pole on distribution system

It Pays to Switch Capacitors . . .

. . . says Texas utility after ten years of experience. Power factor correction, improved voltage regulation, and reduced light-load losses are benefits which offset cost of switching

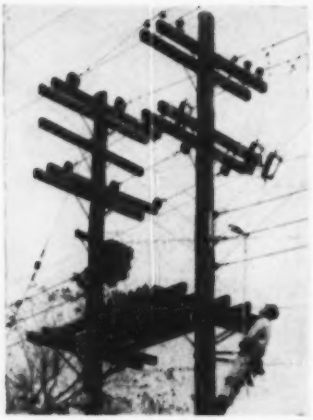
P. H. UNDERWOOD, Supervisor of Distribution Engineering
Houston Lighting and Power Co, Houston, Texas

Houston Lighting & Power Co now has in service 255 large banks of capacitors on its 2.3, 4, and 12-kv distribution system with bank sizes ranging from 300 to 900 ckva. Total capacity of these is 115,470 ckva of which 108,255 ckva is switched. Many of these large banks are in combination, with part of the units fixed and part switched. In addition, there is in service 45,900 ckva on the transmission system and 33,825 ckva in small fixed banks on the distribution system.

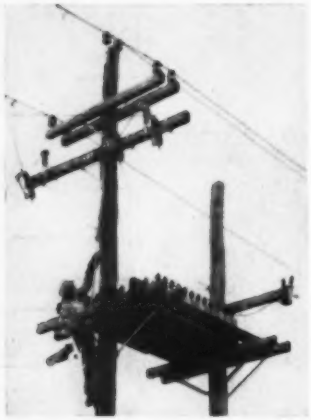
At present day prices for capacitors, power factor correction to 95% or more can be justified on the basis of system capacity used by kilovars. On many systems today the kilovar requirements are approximately equal to kilowatts delivered. If power factor is corrected to 95% the kilovars at peak load must be reduced to approximately one third the kilowatts. Total ckva added for correction must therefore be about two thirds the total kilovars before correction. If maximum amount of fixed capacitors are to be installed, the amount to equal kilovars at light load, about one third that at full load, then approximately one half of the total ckva added must be switched. As correction added by customers is largely in fixed capacitors, the major portion of all ckva to be added by power companies in the future must be of the switched type of capacitor.

Switching Capacitors . . . Present installations on the Houston system are either single pole for 4 kv and 12 kv, or two pole for 2.3, 4, and 12 kv. Single-pole installations are all 300 ckva. Two-pole installations are 360 ckva for 2.3 and 4 kv and up to 900 ckva for 12 kv. Details of these are shown.

Switches used are RCOC Type CP for 2.3 kv and 4 kv, and "GR" switches for 12 kv. Switches are usually connected in the neutral on 'CSO-1" 12 kv, wye, installations. The "CSO-1" switch for 12-kv installations was recently made available at approximately the same price as the "GR" switch. Both the GR and CSO-1 switches are single phase—15 kv with approximately the same current rating when used as capacitor switches. The former is motor while the latter is



ALL 12-KV INSTALLATIONS are of the two pole type. In this case the capacitor bank is rated at 525 ckva in capacity



MAXIMUM CAPACITY of any type of installation is 900 ckva, shown on this 3-phase, 12-kv wye capacitor installation

solenoid operated. For very large installations or installations close to substations where large fault currents are possible, there is available the Type B 1 capacitor switch. This switch is rated 3-phase, 15 kv, 150 amp, with the high momentary current rating of 40,000 amp.

On all present installations on regulated urban circuits and on most installations on unregulated circuits, where the load pattern repeats regularly, time switches are used for control. These are generally timed to come on around 7:00 to 8:00 AM, at approximately 50% of circuit load, and go off at around 10 or 11 PM. They are sometimes equipped with reserve spring clocks and omitting devices to leave the capacitors off on Sundays. On extremely long laterals on some circuits, and on circuits where the load may change suddenly, but does not necessarily repeat from day to day, control is usually of the voltage type. Other type controls are available which are sensitive to current or kilovar, but are more expensive and more intricate.

Protection . . . Short circuit protection is provided by single phase, 15-kv, fused switches. Fusing is about 200% of capacitor bank current.

Lightning protection is provided by standard distribution type arrestors of the valve type—3 kv for 2.3-kv delta and 4-kv grounded wye, and 9 kv for 12-kv grounded wye installations. On many recent installations additional surge protection is provided by connecting one capacitor per phase so as to be on the line at all times, i.e., even when the switch is open.

All capacitor and oil switch cases are permanently connected to the system grounded neutral, when available, and to a ground at the installation. On wye banks, the neutral of the bank is generally connected to the same ground.

Size of Banks . . . It is usually desirable to use moderate size banks, 225 to 300 kva at 4 kv and 450 to 600 kva maximum at 12 kv, rather than large ones on the distribution system even though the unit cost of switching may appear to favor the larger banks. This is true for a number of reasons:

1. There is little to be gained in reduced unit cost of switching for larger banks.

2. There will be fewer outages on smaller banks.

3. There is usually less chance of interference due to harmonic currents.

For a single large bank located on a circuit it may be shown that resonance can be expected for harmonics and percentage voltage rises as follows:

Harmonics—	3rd	5th	7th	9th
% Voltage Rise—	5.5	4	2	0.6

For medium size banks the voltage rise will usually be of the order of 2% or less, corresponding to 7th or higher harmonics which usually are very small.

4. There will be less chance of a capacitor that fails blowing up and destroying adjacent units.

A faulted capacitor has time-current characteristics similar to a fuse.

There will be no damage to adjacent units in a group of capacitors on the same fuse, if one faults to ground, providing the fuse clears faster than the following values:

Amp—	5,000	2,000	1,000	500	200
Sec—	0.0013	0.0052	0.02	0.08	0.7

There will be almost certain damage to adjacent units if the clearing time for the fuse is greater than the following:

Amp—	5,000	2,000	1,000	500	200
Sec—	0.005	0.03	0.14	1.1	100

Fuses having time-current characteristics in between the above values are satisfactory for all practical purposes. The faulted unit will probably crack at the seams or burst open, but will probably not affect adjacent units.

A fuse that will melt in about 300 sec for 50 to 60 amp is about the largest that ordinarily can be safely used.

On the Houston Lighting and Power System this has been borne out. All destructive failures have occurred on large 12-kv banks—principally on the 900-kva size. On some of these the neutral has since been floated in order to limit the amount of fault current. On 4-kv banks there have been few failures even though all are fused with larger size fuses than indicated above. Fault current however is usually low at the points of installation of these banks and the number of units per bank is small.

Location of Banks . . . Capacitor installations should generally be located on a part of the circuit with no single-phase switches in it between the bank and substation. They should not be located on a line of small size conductors, with little mechanical strength, that might be broken easily.

If a primary line is broken and does not fault to ground, there is a feed through the load, or capacitors, to the dead phase, or phases, and through the capacitors to ground. Excessively high voltage may be set up and there may be a possible phase reversal.

On a delta system this type of abnormal condition can be set up by breaking one wire, or opening a line cutout. On a 4-wire grounded wye system, it can be brought about by opening one or two phases. If the capacitor bank has a floating neutral there will be a feed from the hot wire, or wires, through the capacitors to the

dead phases and then through phase to neutral load. On a capacitor bank with grounded neutral there will be a feed through primary of wye-delta transformers with floating neutral to the dead phases and then through capacitors to ground.

Cost of Switched Banks . . . Single pole installations with time switch control cost, excluding pole cost, approximately $500 for 4-kv and $600 for 12-kv installations. Two-pole installations with time switch control, including cost of 1 pole, assuming other pole is an existing line pole, cost approximately $700 for 2.3- and 4-kv installations, and $800 for 12-kv installations.

Using the above costs, the total costs for banks of various sizes, including capacitor costs plus overhead, are shown in Table 1.

Fixed capacitor banks cost approximately $170, exclusive of capacitors, for single pole installations. The total costs, including capacitors plus overhead, for the largest practical size of fixed banks consisting of 15-kva and 25-kva units are as follows: For 180-ckva banks of 12-15-kva units, $1,214 for 4-kv, and $1,400 for 12-kv installations, or $6.75 and $7.77 per ckva, respectively; and for 150-ckva banks of 6-25-kva units, $854 for 4-kv and $943 for 12-kv installations, or $5.70 and $6.28 per unit ckva respectively.

Defining the unit cost of switching as the difference between the unit costs of switched and fixed installations, the unit switching costs are shown in Table 2.

Benefits From Switching . . . Added benefits from switching more than pay for any added unit ckva installed cost, and in some cases justify switching more than the minimum amount of capacitors that must be switched. Some of the benefits from switching are:

1. Improvement in voltage regulation. Capacitors on circuits when switched are equivalent in effect to one-step regulators. All capacitors on the substation distribution act as bus regulators, one or more steps. If circuits are unregulated, switched capacitors provide some voltage regulation. If circuits are regulated, switched capacitors in effect increase the range of the regulators.

Depending on the amount of transformer reactance, it is possible and practical to provide voltage boosts on substation buses of 5% or more if required. On feeders, boosts by several per cent are possible, depending on how far out on the circuit away from the substation the capacitors are installed.

2. Provision of emergency voltage boosts. Large capacitor banks have been installed on the transmission system where they can be switched on under emergency conditions to provide a boost in voltage. In many cases, and probably most, it would be more advantageous to provide switched capacitors on the distribution system in the area.

3. Reduction in losses. The removal of capacitors from the system at light load periods will prevent operation at leading power factor at those times, reducing line current and therefore line losses.

4. Reduction in possibility of interference due to harmonic currents. Harmonics are most prevalent at times of light load. Removal of capacitors from the system at such times will prevent over-voltage and remove the possibility of a resonant condition being set up.

5. Prevent over-voltage.

6. Reduction in possibility of over-voltage and possible phase reversal due to broken primary lines.

It is difficult to place a value in dollars on many of the benefits from switching capacitors. However, it is possible in the case of voltage regulation to obtain some idea of its value. Calculations show that improvement in regulation through switching capacitors justifies a switching cost for capacitors installed on the substation bus of approximately $2.00 per kva, or more than twice the cost of switching.

For 4-kv feeder regulation a feeder voltage regulator installation consisting of three 300-amp ± 10%, single-phase regulators costs around $10,000 and will provide regulation for approximately 2,000 kva at 4 kv, with total range of 20%.

The amount that can be spent for switching capacitors therefore will range between $4.25 and 6.25 per ckva, or several times the actual cost of 4-kv switching.

Conclusion . . . Automatic switching of a large part of all capacitors installed on the distribution system is necessary when they are installed in the amounts now justified at present day capacitor prices.

Equipment is available for the building of switched installations, or factory-assembled banks can be purchased at reasonable cost by the utility.

The experience of the Houston Lighting and Power Co over a ten year period indicates that these installations give satisfactory service. Switching costs of the order of $1.00 per ckva, or less, are possible. The value of the benefits obtained from switching is more than enough to pay for the cost of switching.

Table 1—Installed Cost of Capacitor Banks

Size (ckva)	Bank Type	Capacitors	Installation Cost	Capacitor Cost	Total Cost	Unit Cost per Ckva
300	1 Pole 4 kv	12-25's	$500	$1,369	$1,869	$6.23
300	1 Pole 12 kv	12-25's	600	1,547	2,147	7.16
360	2 Pole 2.3 kv	24-15's	700	2,088	2,788	7.75
360	2 Pole 4 kv	24-15's	700	2,088	2,788	7.75
450	2 Pole 12 kv	18-25's	800	2,390	3,190	6.93
600	2 Pole 12 kv	24-25's	800	3,094	3,894	6.49
750	2 Pole 12 kv	30-25's	800	3,867	4,667	6.22
900	2 Pole 12 kv	36-25's	800	4,680	5,480	6.09

Table 2—Comparison of Switching Cost

Size (ckva)	Bank Type	Capacitors	Ckva Unit Cost		Ckva Unit Cost of Switching
			Switched	Fixed	
300	1 Pole 4 kv	12-25's	$6.23	$5.70	$0.53
300	1 Pole 12 kv	12-25's	7.16	6.28	0.86
360	2 Pole 2.3 & 4 kv	24-15's	7.75	6.75	1.00
450	2 Pole 12 kv	18-25's	6.93	6.28	0.65
600	2 Pole 12 kv	24-25's	6.49	6.28	0.21
750	2 Pole 12 kv	30-25's	6.22	6.28	0.06
900	2 Pole 12 kv	36-25's	6.09	6.28	0.19

FLUORESCENT LIGHTING has opened new possibilities for use of higher voltage circuits to reduce cost of the power system. Trend toward load center power distribution systems makes possible the use of combined light and power systems. Picture shows airline engine overhaul shop having continuous rows of 2-lamp, 85-w industrial units providing intensity of 70 ft-c. Design and construction by Austin Co

High Voltage Lighting Can Halve Copper Usage

Industrial plants can cut cost and save copper on their power systems by using higher voltage circuits for fluorescent and mercury vapor lamps. Here the author compares three systems of power supply to lighting loads and outlines the economies of combined light and power systems and higher voltage circuits

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Adequate lighting for factory areas is recognized as necessary for better production and safety. Illumination levels of 50 ft-c are good modern practice, and levels as high as 100 ft-c are not uncommon. Load intensities of 2 to 4 va per sq ft for lighting and 6 to 10 va per sq ft for power are normal. Therefore, lighting distribution systems are worthy of investigation. Just as modern power distribution practices have paid dividends, so can modern lighting distribution practices.

Fluorescents Offer New Possibilities . . . Until the fluorescent lamp most distribution of power for lighting loads was at 120 v. Higher-voltage incandescents are fragile and generally not satisfactory. In modern lighting, fluorescents are often used alone or in combination with incandescents. Since the fluorescent lamp has a ballast in series with it, the 120-v limitation no longer applies.

For instant starting, fluorescent lamp voltage is always above 120 v. This higher voltage is supplied by a transformer built into the ballast. Thus the use of fluorescent lamps offers opportunities to cut power system costs through the use of higher volt-

ages. And the trend toward load center power distribution systems has made possible the use of combined light and power systems.

Three Distribution Systems . . . Because of the 120-v limitation imposed by incandescent lamps the 208Y/120-v or 240/120-v systems have been commonly used for lighting circuits. However, industrial plants have long recognized the benefits of higher voltages for motors, and 480 v is a common power load voltage. Such a system is System A (Fig 1). This includes a 208Y/120-v, 3-phase, 4-wire system for lighting and a 480-v system for power load. Two separate substations are required.

An alternative is a combined light and power system using the same substation for both power and lighting. System B (Fig 2) includes a 480-v substation with small, step-down transformers located throughout the plant to supply lighting load at 120 v. This system has the advantage of using one substation instead of two smaller ones but still uses the low 120-v for lighting.

The third system goes a step further and uses a higher voltage for the fluorescent lamps. System C (Fig 3) uses the same substation for supplying power to the plant using a 480Y/277-v, 3-phase system. The power load is supplied at the line-to-line voltage of 480 v. The lighting load is distributed on the three phases but connected from one line to neutral at 277 v.

Basis of Comparison . . . In order to have a basis for comparison these three systems are assumed to be serving typical industrial plants identical in size and shape. A lighting load of 3.1 va per sq ft was assumed. In addition it is assumed that ½ va per sq ft is required for 120-v convenience outlets. With these load densities as a basis the nearest standard size substations are selected, and calculations are based on these standards.

To allow for diversity, the secondary feeders and breakers and the branch circuits for lighting are assumed to be 25% larger than the capacity for which substation is designed.

Since it is assumed also that the primary feeders are the same for all systems, only the following items are considered: substation for lighting, secondary lighting feeders, panel-

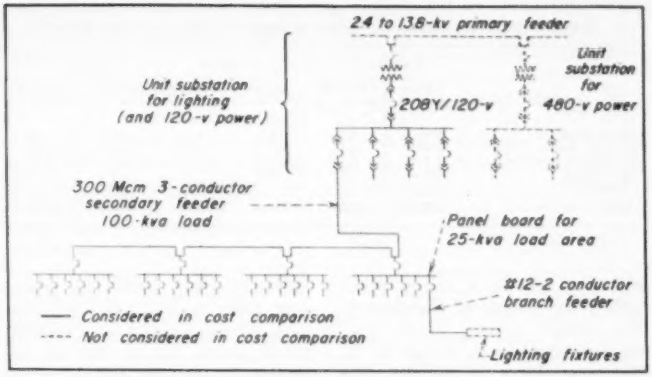

2.4 to 13.8-kv primary feeder
Unit substation for lighting (and 120-v power)
208Y/120-v
Unit substation for 480-v power
300 Mcm 3-conductor secondary feeder 100-kva load
Panel board for 25-kva load area
#12-2 conductor branch feeder
Considered in cost comparison
Not considered in cost comparison
Lighting fixtures

FIG 1—SYSTEM A has separate substations for lights and power, includes a 208 Y/120-v, 3-phase, 4-wire system for lighting and a 480-v system for the power load

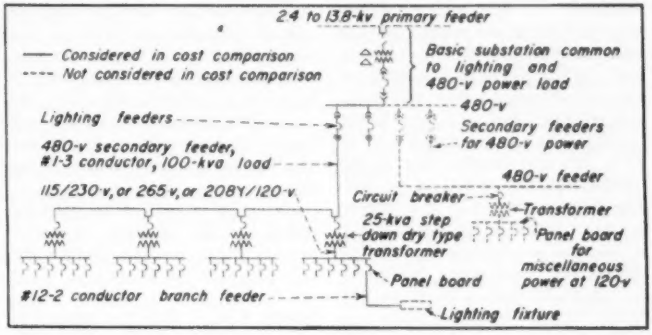

2.4 to 13.8-kv primary feeder
Considered in cost comparison
Not considered in cost comparison
Basic substation common to lighting and 480-v power load
480-v
Lighting feeders
Secondary feeders for 480-v power
480-v secondary feeder, #1-3 conductor, 100-kva load
480-v feeder
115/230-v, or 265 v, or 208Y/120-v
Circuit breaker
Transformer
25-kva step down dry type transformer
Panel board for miscellaneous power at 120-v
Panel board
#12-2 conductor branch feeder
Lighting fixture

FIG 2—SYSTEM B has 480-v substations for combined light and power with small step down 120-v lighting transformers located throughout plant. System uses only one substation

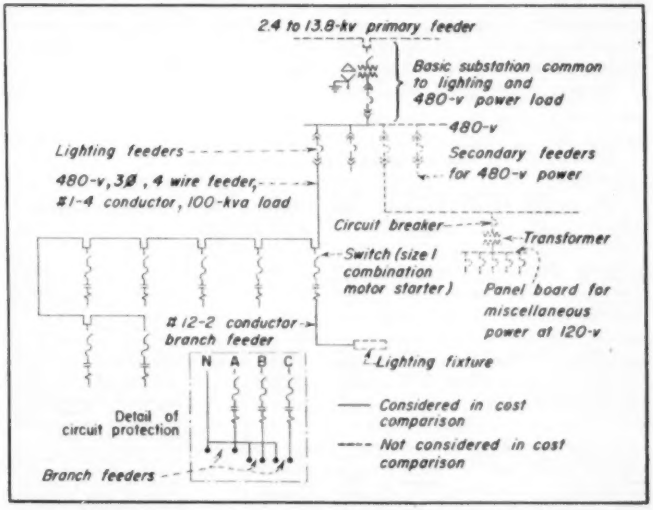

2.4 to 13.8-kv primary feeder
Basic substation common to lighting and 480-v power load
480-v
Lighting feeders
Secondary feeders for 480-v power
480-v, 3Ø, 4 wire feeder, #1-4 conductor, 100-kva load
Circuit breaker
Transformer
Switch (size 1 combination motor starter)
Panel board for miscellaneous power at 120-v
#12-2 conductor branch feeder
Lighting fixture
N A B C
Detail of circuit protection
Considered in cost comparison
Not considered in cost comparison
Branch feeders

FIG 3—SYSTEM C uses same substation for supplying 480 Y/277-v, 3-phase, 4-wire for power and lighting load. Fluorescent lighting circuits are supplied with 3-pole combination motor starters having current limiting fuses and with overload elements removed

Table I—Installed Costs and Weight of Copper per kva for Each System

Equipment	SYSTEM A		SYSTEM B		SYSTEM C	
	Installed Cost kva	Copper Wt per kva—lb	Installed Cost kva	Copper Wt per kva—lb	Installed Cost kva	Copper Wt per kva—lb
Lighting Substation	$41.66	6.25	$18.12	3.08	$18.12	3.08
Secondary Feeders	$22.33	14.47	$ 9.20	4.00	$14.97	6.73
Panelboard or Controller	$ 6.85	0.17	$ 6.85	0.17	$ 6.00	0.07
Branch Circuits (inc. outlets)	$11.25	1.39	$25.25	6.39	$ 7.65	1.40
Totals	$82.09	22.28	$59.42	13.64	$46.74	11.28

boards or controllers, branch circuit wiring, and step-down transformers. The branch circuit wiring from the panelboard to the trough of the fluorescent lamp is included, but the wiring within the fixtures and the fixtures themselves are omitted.

System A . . . With separate substations for lighting and power a 300-kva unit substation supplies the lighting load. In the 208Y/120-v substations this size represents about the lowest cost per kva. Assuming three feeder breakers and an installation cost of 25%, the total installed cost of the lighting substation is $41.66 per kva. This includes use of 6.25 lb of copper per kva. Although the 300-kva unit is the most economical size, smaller lighting and larger power substations are generally used. Therefore the figures given are minimum values.

The load per secondary feeder is assumed to be 100 kva. The 4-conductor, 300,000 cir mil, interlocked armor cable has an installed cost of approximately $22.33 per kva, and the cable takes 14.47 lb of copper per kva. Depending upon the type of building construction and local codes, bus way instead of armor cable might be used. Bus way has many advantages such as flexibility and in general can be installed for substantially the same cost.

Each feeder supplies four lighting panelboards for the lighting circuits and the convenience outlet circuits. The panelboards have an installed cost of approximately $6.85 per kva and use 0.17 lb of copper per kva. Two-conductor No. 12 BX cable is used for all lighting and outlet circuits. The total installed cost of all branch circuit wiring is $11.25 per kva, and use of copper is 1.39 lb per kva.

As shown in Table 1, the total installed cost for all System A equipment is $82.09 per kva. System use of copper is 22.28 lb per kva.

System B . . . Since one substation will supply all power for lighting and motor loads, a 1,000-kva substation is chosen as the basis. As only the lighting systems are being compared, a substation with three feeder breakers (100 kva per feeder) is selected. Such a station has an installed cost of $18.12 per kva and uses 3.08 lb of copper per kva.

The lighting load is supplied by three 100-kva feeders as shown in Fig 2. The interlocked armor cable for these feeders is 3-conductor No. 1 which has an installed cost of $9.20 per kva and uses 4 lb of copper per kva. The panelboards are assumed to be the same as before with a cost of $6.85 per kva and copper usage of 0.17 lb per kva.

As noted in Fig 2, each feeder cable supplies four 25-kva step-down transformers for the lighting circuits. Each transformer supplies one panelboard which in turn supplies the branch circuits. These small stepdown transformers have an installed cost of $14 per kva and a copper usage of 5 lb per kva. The branch circuits are the same as in System A and are included at $11.25 per kva and a copper usage of 1.39 lb per kva. Total installed cost of transformers and branch circuits is $25.25 per kva and their copper usage is 6.39 lb per kva.

Thus the totals for System B become $59.42 per kva and 13.64 lb of copper per kva.

System C . . . As in System B a single substation is used to supply both power and lighting loads. But 277 v is used for fluorescent lighting. A 1,000-kva unit substation is selected as in System B. Thus installed cost and copper usage is the same as for system B, $18.12 per kva and 3.08 lb per kva.

Since this system uses 277 v on the fluorescent lighting circuits, slightly different equipment must be used. Instead of panelboards, 3-pole, size 1 fused combination motor starters with current limiting fuses and with overload elements removed are used to supply the lighting circuits. Three branch circuits at 277 v line to neutral are taken from each motor starter. Since such circuits are limited to about 20 amp, the lighting load per controller is limited to about 14 kva instead of the 25 kva distributed by each panelboard in Systems A and B. Such controllers cost $6 per kva and use 0.07 lb of copper per kva. It should be noted that although the ballast voltage is higher, the fluorescent lamp voltage is the same as in Systems A and B.

Since each controller supplies only 14 kva, the areas served are smaller. Thus more secondary feeder and less branch circuit wiring is required. The interlocked armor cable for the sec-

TABLE II—Summary of System Comparisons

Type of System	First Cost per KVA	Voltage to Ground	Voltage on Fluorescent Lamps and Starters	Short Circuit Current	Flicker Caused 480-V Power Load	Ground on Power System	Where Most Adaptable
A—Separate Lighting, and Power Substations Fig. 1 —208Y 120 v	$82.09	less than 150	Same for all systems	High (more than 5000 amp)	None	Not required	Where all 480-v buses have too great fluctuations in voltage, due to resistance welders, and where the total 120-v load is over 50 per cent of the total load at 600 v or less
B—Combined Lighting and Power Substations, Step-down lighting transformers, Fig. 2	$59.42	less than 150	Same for all systems	Low (less than 5000 amp)	Possible (due to resistance welders)	Not required	Plants now having 480- or 575-v delta systems. Where total lighting and miscellaneous load is less than about 50 per cent of the total load at 600 v or less. Adaptable for incandescent, fluorescent, or any other kind of lighting
C—Combined Lighting and Power Sub-stations, 3-phase, 4-wire, 480Y/277 v Fig. 3	$46.74	277	Same for all systems	*Low (less than 3000 amp)	Possible due to resistance welders)	Yes	In new factories or in old factories where new 480-v power systems are installed. Adaptable only for fluorescent or mercury-vapor lighting. Not adaptable to 575-v power systems

* Using Size 1 fused combination motor starters for controlling lighting circuits

ondary feeders is 4-conductor, No. 1 with an installed cost of $14.97 per kva and copper use of 6.73 lb per kva.

Although less branch circuit wiring is required for the lighting circuits, the same amount is required for the outlet circuits. In addition, small stepdown transformers are required for furnishing the necessary 120 v for the outlet circuits. The total installed cost of all branch circuit wiring and the stepdown transformers is $7.65 per kva and these items include 1.4 lb of copper per kva.

Total installed cost of all System C equipment is $46.74 per kva and copper usage is 11.28 lb per kva.

Short Circuit Currents . . . Some engineers have objected to System C since, at first glance, the high circuit currents of the power system seem to be available on the lighting system. However, the short circuit currents on the lighting system are actually quite low when the fused combination motor starter is used for controlling the lights. The starters are equipped with silver-sand, current-limiting fuses which very definitely limit short circuit currents to low values. Not more than 6,000-amp peak short circuit current can flow to a fault in the lighting system even though the available short circuit current on the 480-v system may be as high as 50,000 amp. Twenty-amp fuses are used in the controllers to give proper protection to the fluorescent lamp ballast against overload.

In this regard, it should be noted that a 480Y/277-v system, for example, requires better protection than a 120-v system. With the lower voltage system it is difficult, if not impossible, to get a restrike when a short circuit occurs. The short will generally burn itself free with no restriking on a 120-v system. However, with higher voltages it is possible to get restriking; therefore, the highest protection is indicated. The silver-sand, current-limiting fuse protects the entire branch circuit of System C.

Actually the short circuit protection generally furnished with System A is less adequate than that described above for System B or C. It is recognized that the circuit breakers in the panelboards do not have sufficient interrupting rating (only 5,000 amp) for service in System A. However, there are no available devices which meet the space requirements for this service and have adequate interrupting rating for the short-circuit current duty imposed on them.

Grounding . . . System C, the 480Y/277-v system, must have the neutral grounded to accommodate 264-v lighting fixtures. While some operators who have not had experience with 480-v grounded Y systems may object to grounding, there are many advantages to having the system neutral grounded, even though 264-v lighting fixtures may not be used. The biggest single advantage of grounding any power system is immediate isolation of a ground fault before it develops into a double line to ground fault, tripping out a considerable portion of the load.

Voltage Flicker . . . Voltage flicker caused by fluctuating power loads will not cause objectionable light flicker in the average factory. Large resistance welders, or large motors which start frequently, should not be connected to the 480-v bus that serves the plant lighting. Resistance welders are being used in increasing quantities in manufacturing plants, particularly in those that fabricate metal products. In many larger plants employing load center power distribution systems, the welders are connected to a separate transformer which supplies nothing but welding load. In these plants there is no problem of lamp flicker because of resistance welders, unless the plant is supplied by a very weak primary system, in which case the flicker problem will be essentially the same whether or not combined light and power systems are used.

Welder Load . . . In manufacturing plants where the total resistance welder load is not sufficient to justify separate welding transformers or where there are no exceptionally large welders, the secondary selective arrangement of the load center distribution system may be used, with one of the two substations for general power load and resistance welders and the other for combined light and power. During normal operation the two substation buses are not in parallel, and the flicker on the bus to which the welders are connected will not affect the lights connected to the other bus.

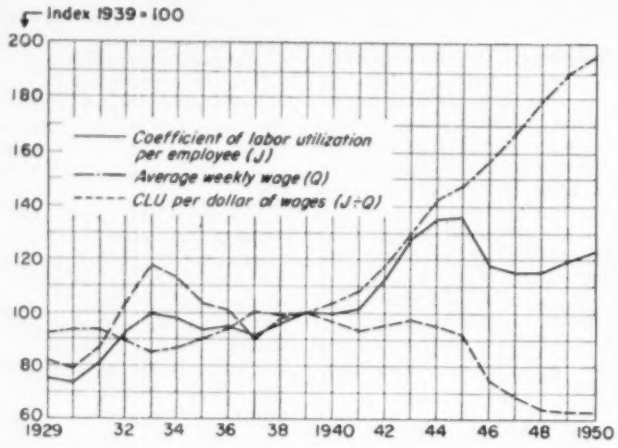
Reliability . . . With either System B or System C separate feeders should be used for serving lighting load only. There are many more outages on power feeders than on lighting feeders because of the greater number of changes made in power feeders. Furthermore, the power feeders may have more voltage drop because of fluctuating loads. Hence separate lighting feeders should be used for greater reliability and to reduce feeder voltage drop.

With any of these systems, consideration should be given to overlapping the area fed by one substation, so that an outage on that substation will not cause complete outage of lamps in any one area. One method of accomplishing increased reliability economically is by the utilization of the secondary selective load center power system.

Other Lighting . . . In Systems A and B 120 v are available for general area lighting, as well as miscellaneous 120-v power and lighting. Therefore, all load other than 480-v load can be taken off the same circuit in those two systems.

With System C, 264-v ballasts should be used only in fixtures for general area lighting. These fixtures must be more than 8 ft from the floor and must not have individual switches mounted in the fixtures. The National Electric Code requires that all lighting for individual benches, machines, etc, should be operated at 120 v. Since there is always some load of this nature around any plant, it is necessary to obtain the power for that load from the 480-v feeders of System C. This is accomplished, as pointed out earlier, with small dry-type transformers.

Frequently industrial plants are designed with a sizeable office area at one end of the factory area. Here again System C can be used for general area fluorescent lighting within the office area. In such a building, System C as described above would be used for the factory area. One or more feeders would also be run into the office area for general lighting. Whereas controllers are used as the remote control devices in the factory area, a new remote control scheme is used in the office area. Instead of industrial controllers, this scheme uses small relays, a transformer, and small wall switches. The relay contacts operate in the 480Y/277-v system, but the relay coil is supplied with 24 v from the small transformer. Thus only 24 v is in reach of an operator.



Coefficient of Labor Utilization Per Employee vs Weekly Salaries & Wages

While the coefficient of labor utilization has shown only a very modest increase from 1940 to 1950, the per cent increase in average weekly wages exceeded this rate of increase by more than 200%. Consequently, utilization of the payroll dollar decreased from an index of 96.1 in 1940 to 62.9 in 1950 or a decrease of 34.6%

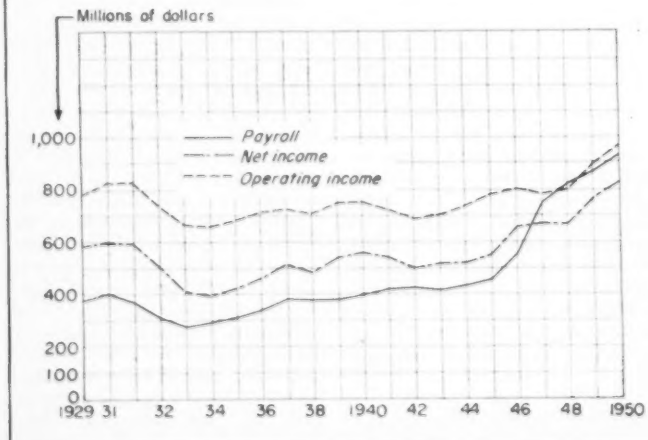
Use Customers and Capacity

New Coefficient of Labor Utilization to measure use of manpower by utilities has been devised to replace index of productivity based upon kilowatt-hour sales per man-hour

Labor is now the second principal electric utility cost component, outranking by substantial amounts the cost of fuel, and being only slightly lower than the industry's current tax liability.

Of the total wages of both capital and labor, labor has taken a progressively greater share each year. It is only the reduction in money costs over the last two decades that has partially offset this trend. Since no further reduction in money costs can be anticipated, the participation of labor in the total wages of both capital and labor may well grow at an even faster rate than heretofore.

The payroll economics of the investor-owned electric utility industry and the relationship of payroll both to the physical scope of the industry's operations and its financial structure have received comparatively little analytical attention. However, in the

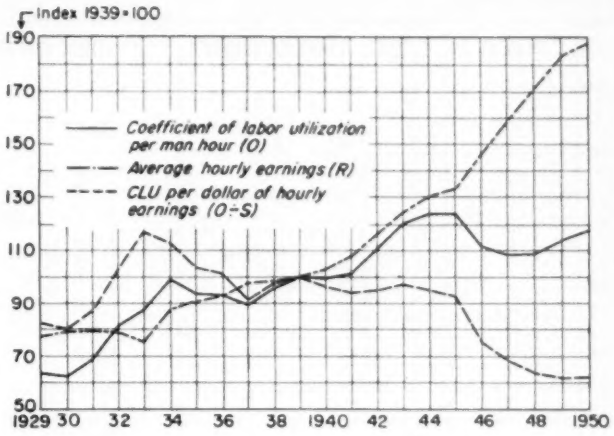


Relationship of Payroll to Operating Income and Net Income

While payroll increased from $394 million in 1940, to $924 million in 1950, or an increase of 135%, operating income or the total wages of capital increased from $750 million to $963 million or only 29%. Because of refinancings the percentage increase in net income in this period was somewhat greater amounting to 48%

Coefficient of Labor Utilization Per Man-Hour vs Average Hourly Earnings

Trend of the coefficient of labor utilization and hourly wages indicates that while C.L.U. increased only nominally by 1.62% per annum, average hourly rates rose by 6.15% per annum. In other words, hourly wages increased 280% faster than the utilization of labor. Consequently the utilization of labor per payroll dollar decreased from an index of 96.5 in 1940 to 62.2% in 1950 or a decrease of 35.5%



To Gage Labor Utilization

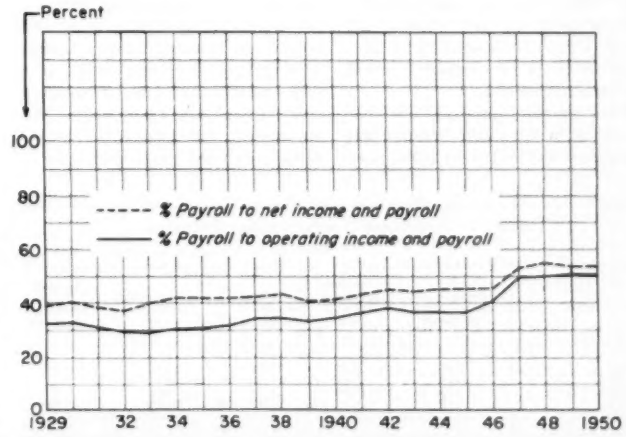
C. P. GUERCKEN
Assistant to Vice President, Ebasco Services, Inc

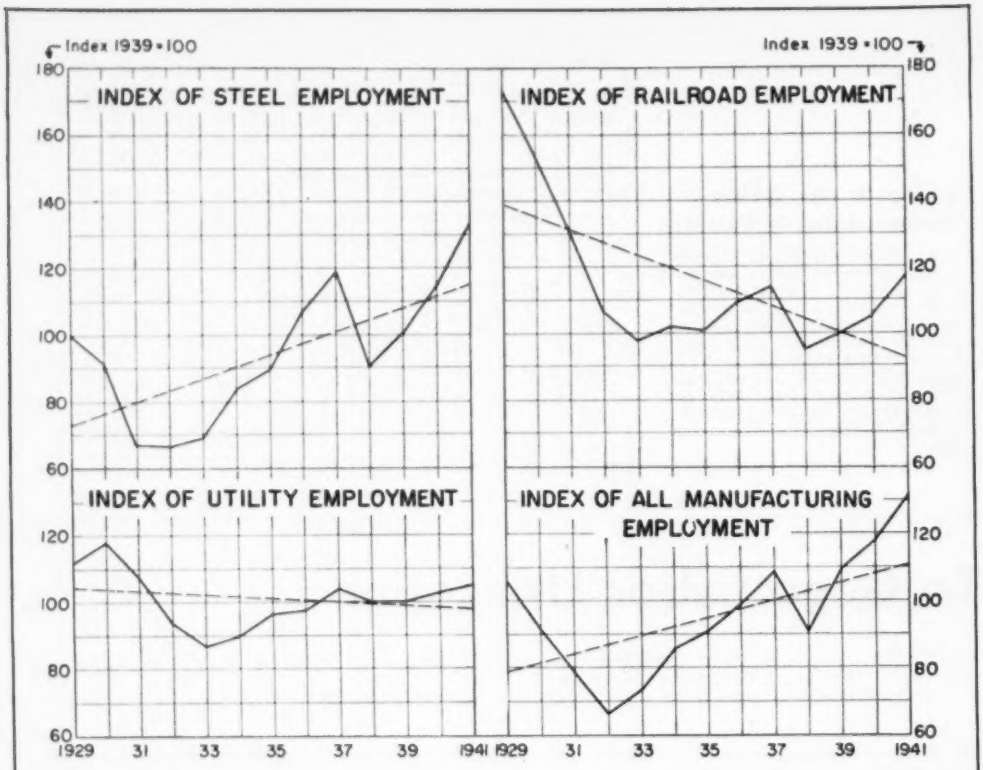
field of manufacturing, considerable interest has been displayed since 1945 both by management and labor in so-called "productivity." In the electric utility field, the Bureau of Labor Statistics has published a series called "Statistics of Productivity and Unit Labor Costs of the Electric Utility Industry," wherein kwhr sales of the industry are divided by the estimated man-hours employed by that industry. It is felt that this ratio has no significance since the prime measures of labor's productivity are the total number of customers served and the kilowatt capacity of the system's generating plants per manhour. It is therefore desirable to devise an index relating system operations to labor input.

New Index Proposed . . . The Coefficient of Labor Utilization as devised and outlined in this article accomplishes this to a substantial degree.

Distribution of Wages of Capital & Wages of Labor in Per Cent of Total

Trends on this chart indicate that labor has taken a progressively greater share of the total wages of both capital and labor since 1940. Thus in 1940, while the share of labor amounted to 34.5% of the total, by 1950 this has increased to 51.0% or a relative rise of nearly 50%





Utility Employment vs Other Industries

The above series of charts show the far greater stability of employment in the utility industry as compared to the other industries under consideration. Computed mathematically this factor of stability indicates that an employee in the private electric utility industry has had nearly twice the steadiness of employment that a worker in either steel, railroads or all manufacturing has enjoyed during the period from 1929 to 1941.

This index is not a measure of the efficiency or productivity of labor, but merely a more accurate index of labor input in terms of customers served and capacity installed.

The purpose of analyzing the labor utilization in the utility industry was to measure the long term inflationary trend in the national economy compared with the technological productivity of the industry. Since the utilities have to deal in current dollars both with regard to their "regulated" revenues and their "free market" disbursements, the relationship of the above-mentioned trends will demonstrate the rate of erosion which has taken place in the utilization of the payroll dollar in terms of labor input.

Table 1—Significant Trends in Labor Utilization
(Percent)

Period	Increase in CLU per employee per annum	Increase in average weekly wages	Ratio of wages to CLU	Decrease in CLU per dollar	Increase in unit labor costs per annum
1930-50	2.60	3.80	1.46	1.15	1.15
1933-41	0.23	3.10	12.60	2.90	2.90
1941-45	7.70	8.25	1.07	0.50	0.50
1930-40	3.12	1.10	0.35	(2.00)	2.00*
1940-50	2.13	6.70	3.15	4.40	4.40

( ) denotes increase and *denotes decrease

B. L. S. Index Misleading . . . The B. L. S. index of employee productivity, which is based on the relationship of industry man-hours to the kwhr output, is misleading, since it entirely overlooks the factors of capacity on the one hand and the number of customers the industry serves on the other. The manpower requirements are substantially independent of the physical output of the system. Thus, a single unit gas-burning station on "hot standby" would have practically the same crews per shift as would be required if the station were operated at say 80% or 90% load factor. There may be some additional

Coefficient of Labor Utilization and other Pertinent Statistics

		1950	1945	1940	1939	1935	1930
A	Number of Employees	293,000	203,500	247,850	242,275	233,550	285,650
B	Hours Worked per week	41.5	43.5	39.7	39.5	39.3	47.0
C	Total Man Hours per annum (000)	633,000	461,000	511,000	498,000	477,000	699,000
D	Number of Customers (000)	37,300	29,025	26,300	25,625	22,800	22,100
E	Capacity of Plant in Kw (000)	55,200	40,307	34,399	33,908	31,820	30,285
F	Customers per Employee	127.4	142.8	106.2	106.0	97.6	77.4
G	Index 1939=100	120.2	134.5	100.2	100.0	92.1	73.0
H	Capacity per Employee—Kw	188.5	198.2	139.0	140.0	136.2	106.1
I	Index 1939=100	134.8	141.7	99.2	100.0	97.5	75.8
J	**Coefficient of Labor Utilization per Employee (4G+I)÷5**	**123.1**	**135.9**	**99.8**	**100.0**	**93.2**	**73.6**
K	Customers per man hour	.0589	.0630	.0515	.0515	.0478	.0316
L	Index 1939=100	114.5	122.4	100.0	100.0	92.8	61.5
M	Capacity per man hour—Kw	.0872	.0874	.0673	.0681	.0667	.0433
N	Index 1939=100	128.0	128.4	98.8	100.0	97.9	63.6
O	**Coefficient of Labor Utilization per man hour (4L+N)÷5**	**117.2**	**123.6**	**99.8**	**100.0**	**93.8**	**62.0**
P	Average weekly earnings per employee	$66.20	$50.05	$35.08	$33.81	$30.48	$31.50
Q	Index 1939=100	195.6	148.1	103.9	100.0	90.2	93.2
R	Average Hourly Earnings—cents	161.0	114.1	88.4	85.5	77.5	67.0
S	Index 1939=100	188.5	133.5	103.5	100.0	90.6	78.5

Note: The coefficient of labor utilization is a weighted index based on the average of four times the customer index plus one KW capacity index. This weighting corresponds to the relative importance of employment within and without the generating divisions. Since the four to one ratio is for industry as a whole, individual companies would have to determine these ratios based on conditions prevailing within their own systems.

requirements in the way of maintenance crews if it is a multi-unit station, but such additional man-hours would be a very small percentage of the total man-hours of the system. In the case of solid fuel stations, a large increase in output would require some additional men for fuel handling but, by and large, in a medium-sized station 80% to 90% of the man-hour requirements would be completely independent of its output.

Similarly, in the transmission and distribution end of the business, only negligible changes in the man-hour requirements of the system are indicated if the out-put increased from say 20% to 90% of normal, while in customer accounting and meter reading the same routine and procedure would be followed by the employee if the customer used 1 or 100 kwhr per month.

The index called the Coefficient of Labor Utilization was therefore based on the customers per employee and per man-hour and the kw of installed capacity per employee and per man-hour of the privately owned Class A, B, C and D utilities. These values were then indexed (1939 = 100) in order to combine them for an over-all index of labor input. Since no "break-up" was available on an industry-wide basis for the total employees in the production end of the utilities, an analysis was made of a number of representative companies, in order to determine the percentage of total employees which is chargeable to generation in this group of utilities. This was found to be approximately 20%. The combined index was therefore calculated on a weighted average basis of four customer indices to one kw installed index. Two indices are actually calculated, one based on employees and another on total man-hours, as shown in Table I.

Summary of Findings . . . On the basis of the analysis made in this report it is concluded that the electric utility industry has not been able to match its technological progress in the use of manpower to the inflation which has been imposed on the national economy. While the Coefficient of Labor Utilization per employee has increased, this increase, apart from the artificial stimulation of the war period, has been relatively slow. As shown in Table I, the CLU increased 3.12% per annum from 1930 to 1940 and 2.13% per annum from 1940 to 1950, or a relative decline in the rate of increase during the latter decade of 32%. In the same period, weekly salaries increased at the rate of 1.10% per annum and 6.07% per annum, respectively, or a relative rise in the rate of increase of 509%. While from 1930 to 1940 the CLU per dollar of weekly wages showed a satisfactory increase of 2.00% per annum, the progress of inflation was such that between 1940 and 1950 the CLU per dollar of wages showed the tremendous decline of 4.40% per annum.

Table II—Wages of Labor and Capital for Two Significant Periods

	Millions of Dollars			Percent Increase	
	1930	1933	1950	1950 over 1930	1950 over 1933
Payroll	$400	$270	$924	131.0	242.0
Operating Income	825	662	963	17.0	45.9
Net Income	596	404	822	38.0	104.0

Actual monetary values of the wages of labor and the wages of capital for two significant periods are shown in Table II. They are indicative of the deterioration which has taken place in the position of capital in the utility industry. From the foregoing tabulation it will be seen that both percentage-wise and actually, labor has shown the greatest gains, while the total wages of capital as represented by operating income have shown only very modest increases over 1930. While no figures on the rate of return are available for this period, it should be noted that in these years the industry added more than 24,915,000 kw of capacity, an increase of 82.5% and connected 15,200,000 customers, or an increase of 69.0%. At the same time, operating income increased only $138,000,000, or 17.0%. That inflation took its inevitable toll is witnessed by the fact that, according to "Engineering News Record," construction costs were 151.0% higher in 1950 than they were in 1930.

With the same coefficient of labor utilization in 1950 as in 1944 (six year drop from 123.9 to 117.2) payroll saving would amount to $50 million.

HERE'S WHERE IT STARTED. Original demonstration installation of six lamps along a few hundred feet of street was so well liked by citizens and town fathers that it was extended to one of 29 lamps and 6,418 feet

"Little Main Streets" Can Use Mercury

How one power company demonstrates the value of modern street lighting in rural communities. Result: traffic safety increases and local business is benefitted

Around 300 mercury vapor, 15,000 lumen, lighting units are scattered about in the rural territory of the Central Hudson Gas & Electric Co in villages and township centers, at bridges and highway intersections.

On the "little main streets" of small communities, traffic problems are sometimes more troublesome than on main city streets. Important through traffic, both passenger car and especially heavy trucking, may pass along these streets twenty-four hours a day. In many cases the streets are narrow and during business hours there is a continuous interchange of cars parked along them. Traffic safety problems may be great in some of these small communities due to adults as well as children stepping out from behind parked cars and crossing between blocks.

Many evenings when the stores are open in the smaller communities, there is an influx from outlying areas of persons who may not have the same contact with the dangers of heavy traffic as their city brothers. In the city business areas there will be several police officers, whereas in the smaller community one police officer or constable may have the entire responsibility of protecting the public and naturally he is unable to be everywhere at once. During the summer many of these communities become crowded with vacationists who jam the business sections at night. Many times these city visitors walk in the streets and highways when there are no sidewalks. This practice presents a tremendous hazard for the motorist, especially if the street lighting intensities are low and the driver is facing glaring headlights.

Three Key Questions . . . About six years ago, Harris Dexter, sales head of our company, asked, "Why aren't mercury lamps the answer for street lighting in small communities?" And we decided to find out by making a test. We wanted to check three things:

1. Would it be practicable as an operating matter to install and service mercury lamps singly and in small groups?

2. Would the residents of small communities accept the characteristic color quality of the mercury lamp?

3. Would citizens and officials like a much higher intensity of street lighting than they were used to?

One of our district managers obtained permission from the officials of a selected community to use the main street for a demonstration. They were told about the mercury street lamp—how efficient it was—and they were also told of its peculiar mono-chromatic light characteristics. They were favorably impressed and gave permission for the demonstration.

The company removed the six existing 2500-lumen luminaires and replaced them with 15,000-lumen series mercury lamps mounted 30 ft above the highway.

The installation had not been in operation a week before it was evident that the demonstration was successful. Company people made personal checks and favorable opinions were received from a number of the citizens of the area. Public officials in other communities were advised of this demonstration and were invited to inspect it. They were impressed with the illumination and no one had any objections to the color of the light source, even though some of the new lights were located where the illumination from display windows and neon signs had no effect in "toning" the greenish tinge of the street lighting.

Acceptance General . . . Other demonstrations followed and soon the

NARROW MAIN STREETS, typical of small communities, are traffic hazards.

Lamps, Too

TAYLOR M. BARR,
Staff Lighting Representative,
Central Hudson Gas & Electric Co,
Poughkeepsie, N. Y.

Mercury Lamps in Rural Communities Served by Central Hudson Gas & Electric Co—October 1, 1951

All lamps are 15,000-lumen, mercury vapor, in reflector enclosures mounted on existing wood poles, 25-ft above roadway. Brackets are 6-ft, except in a few locations where 12-ft are required.

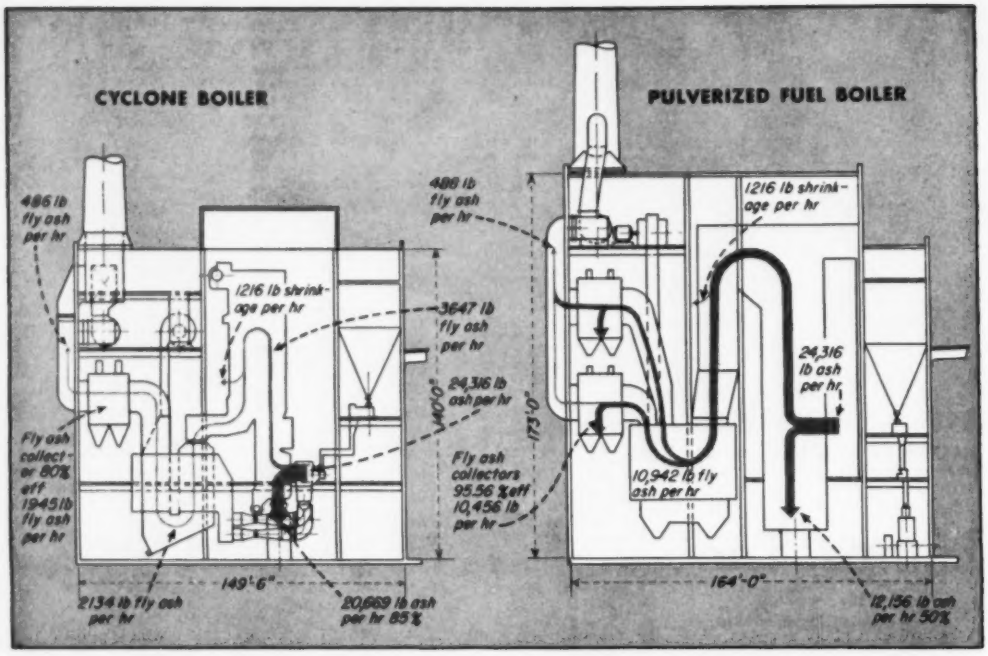
Village or Township	Population	Number of Lamps	Feet of Street Relighted	Spacing
T. Pine Plains	1,357	4	750	187
V. Trivoli	761	8	930	117
V. Red Hook	1,220	7	1,100	158
V. Rhinebeck	1,925	16	3,000	187
T. Poughkeepsie	19,476	29	6,418	222
T. Hyde Park	6,115	1	Intersection	
V. Fishkill	720	1	Intersection	
V. Wappingers Falls	3,498	21	2,250	107
V. Cold Spring	1,786	15	1,650	110
T. Newburgh	8,486	3	394	131
T. Marlborough	4,026	1	Intersection	
T. New Windsor	5,063	4	590	147
V. Cornwall	2,206	5	480	96
T. Cornwall	6,039	15	2,610	174
T. Esopus	4,720	36	10,950	320
T. Esopus	—	3	370	123
T. Lloyd	4,499	24	4,000	167
V. New Paltz	2,284	25	7,200	288
V. Rosendale	671	26	12,230	472
T. Marbletown	2,334	1	Intersection	
T. Wawarsing	9,915	27	7,070	262
T. Woodstock	—	2	300	150
T. Woodstock	2,263	10	3,080	308
V. Saugerties	3,927	1	Intersection	
V. Catskill	5,336	1	Intersection	
V. Athens	1,542	5	510	102
V. Coxsackie	2,715	5	500	100
V. Ravena	2,007	1	Parking lot	
T. Coeymans	4,699	1	Intersection	
		Total 298		**Average 187 ft**

mercury lamp was generally accepted. At the present time there are 27 outlying communities which are using the lamp along their main streets with great satisfaction. Installations range in size from one to 36 lamps and average 10 each. The company has received favorable comments from various public officials in bringing to their attention this light source which has worked out so successfully. These small communities do not have large operating budgets and naturally watch their expenditures very closely. However, they realize that mercury lighting is giving them more and better lighting, thereby reducing traffic accidents and making the community look more "wide awake." While it is difficult to prove, it seems safe to say that some persons in the city areas have been attracted to the smaller communities to build homes there as a result of their seeing these "little main streets" at night. The new street lights have given the citizens in the small community a greater appreciation of the place in which they live. They have also helped the small town merchant in his competitive struggle against the attractions of the stores in larger cities.

In one area alone there had been several traffic fatalities of children. Since the new mercury lighting has been installed there has not been one fatality. Pedestrians are better able to distinguish an approaching car and can more accurately judge how fast it is coming.

The company has found that less maintenance is required because of longer lamp life. It has also found that people are more conscious of street lighting and are in a more receptive mood to consider improvements on side streets.

THEY "SAW THE LIGHT." The main streets of these two small communities are now much safer at night than they were


CYCLONE BOILER
PULVERIZED FUEL BOILER
486 lb fly ash per hr
1216 lb shrinkage per hr
3647 lb fly ash per hr
24,316 lb ash per hr
Fly ash collector 80% eff 19451b fly ash per hr
Fly ash collectors 95.56 % eff 10,456 lb per hr
2134 lb fly ash per hr
20,669 lb ash per hr 85%
149'-6"
164'-0"
10,942 lb fly ash per hr
12,156 lb ash per hr 50%

COMPARISON of space requirements and ash distribution for cyclone-fired boiler and conventional pulverized coal unit. Both boilers burn a total of 162,100 lb of coal with 15% ash to generate 1,200,000 lb of steam per hr. Both deliver equal weight of flyash to stack

Operating Experiences with Ten Cyclone-Fired Steam Generators

- Reduction in emission of fly ash
- Low cost of equipment maintenance
- Good efficiency over wide range
- Smaller size for same capacity
- Economical use of bin firing system

I. L. WADE
Manager of Stations and Substations
Public Service Co of Northern Illinois
Chicago, Ill.

V. L. STONE
Supt of Generating Stations
Commonwealth Edison Co
Chicago, Ill.

Five years of cyclone furnace operation have provided the experience with which to evaluate the merits of this new method of burning coal. Knowledge has been gained on ten different boiler installations by Commonwealth Edison Co and the Public Service Co of Northern Illinois. As with most new developments, not all of the original hopes have as yet been fully realized.

Excerpts adapted from authors' paper of same title at recent annual meeting of ASME in Atlantic City.

The most economical fuel source for the Edison group of companies is known as Central Illinois coal which comes from an area approximately 210 miles from Chicago. This coal has a high ash content and low ash fusion temperature.

Operating Characteristics . . . General operating characteristics of the cyclone firing method indicate that a large boiler can be brought up from cold by firing one cyclone continuously. When lighting a cyclone with other cyclones already in service, duct pressure to that cyclone is throttled by means of the sealing valve in the cyclone duct.

The cyclone furnace slag tap is sometimes fouled with coke and viscous slag during the bring-up. After high rating is established the tap clears itself.

Practical load range of any cyclone is about 25 to 133%; however, undesirable combustion conditions gener-

ally prevail below about 40% rating. Boilers are frequently operated at rated capacity with only three of the four cyclones in service.

Protection against, or warning of, loss of ignition is an important consideration in cyclone firing in that interruptions in coal flow may occur and reignition from other burners is impossible or undependable at best. Coal flow interruptions have been frequent at Ridgeland where an inadequate coal sealing head is provided.

Data on Ten Cyclone-Fired Boilers Installed or Ordered Since 1944

Station	Boiler	Service Date	Cyclones Per Boiler	Firing Method	Boiler Capacity lb/hr	Steam Pressure at S.H. Out. Psi	Steam Temperature at S.H. Out Deg F
Calumet	20-A	Sep. 1944	1	Direct	180,000	350	650
Waukegan	13	Jan. 1949	2	Bin	300,000	675	750
Fisk	18-1	Apr. 1949	4	Direct	750,000	1,325	935
Fisk	18-2	Jun. 1949	4	Direct	750,000	1,325	935
Joliet	3	Jan. 1950	3	Bin	600,000	1,325	1,010
Joliet	4	Jan. 1950	3	Bin	600,000	1,325	1,010
Ridgeland	2-1	Oct. 1950	4	Bin	730,008	1,900	1,050
Ridgeland	2-2	Oct. 1950	4	Bin	730,000	1,900	1,050
Ridgeland	1-2	Mar. 1951	4	Bin	730,000	1,900	1,050
Ridgeland	1-1	May 1951	4	Bin	730,000	1,900	1,050

Maintenance . . . In the bin system of coal preparation at Joliet Station maintenance cost of wear parts in the crushers is approximately 0.8 cents per ton of coal. Life of the crusher hammers is approximately 120,000 tons of coal and crusher bars 240,000 tons of coal.

In the direct-fired system at Fisk Station maintenance costs including Redler conveyors, feeders, crushers, burners, and other parts comprising the coal equipment is approximately seven cents per ton of coal. Life of a set of crusher hammers is about 85,000 tons and of crusher bars about 125,000 tons.

Cyclone wear occurs mainly in the inlet scroll and on the cone surface. Life of alloy cast iron or alloy cast steel scroll liners has been determined as about 30,000 tons in the more severe wear regions. Six tungsten carbide-faced liners have been in service for over a year and have handled some 55,000 tons of coal at this writing. Burners are now designed with covered access slots through which the shorter lived scroll liners can be replaced without entailing boiler outage.

No tube failures have occurred in any of the cyclone-fired units that might be attributed to circulation or boiler water conditions.

The primary furnace slag tap cooling coils have required considerable maintenance.

Dust Emission . . . Dust emission from the Calumet boiler was reported as 0.659 grains per standard cu ft (32 F and one atmosphere) under normal operating conditions.

Initial tests at Fisk indicated furnace dust emission of about 0.56 grains per standard cu ft with 22% excess air. Guarantee equivalent was 0.719 grains.

Centrifugal type dust collectors installed at Fisk have to date proved unsatisfactory. Overall collection efficiency has been about 48%. The electrostatic precipitators at Ridgeland have provided a low stack discharge of about 0.095 grains.

Evaporative efficiencies at rated loads are about 87 to 88%.

Operating Difficulties . . . In the bin system of coal preparation the crusher tends to create a fan action which produces an air flow counter to coal flow and creates a dust nuisance.

Fouling of heat transfer surfaces leaves much to be desired although progress has been made. Operating the boilers at over rated capacity intensifies fouling.

Several fires and explosions have occurred that may or may not be associated with cyclone firing and the storage of crushed coal. Origin of the fires is not definitely known.

In May 1951, a severe explosion occurred in the coal handling plant at Ridgeland Station. An investigation developed the supposition that the explosion was the result of gas, principally methane, which was liberated in the bunker from the high specific surface of the crushed coal.

Conclusions . . . It is felt that the difficulties experienced are solvable and are now on the way to correction. Troubles did appear and some were expected, especially so during this era of rapid expansion when time was not available for a slow sure pattern of development.

Several of the operating advantages accruing to the cyclone firing method originally predicted have not been realized but the outlook for a dependable and suitable method of burning high ash coal appears favorable. Conclusions to date may be summarized as follows:

1. Cyclone furnaces have greatly reduced the amount of fly ash carried out of the furnace.

2. The maintenance cost of burner equipment and coal preparation equipment is low.

3. The relatively large size coal used permits economical use of the bin system of firing with its attendant simplification.

4. Boiler efficiency has met design expectations.

5. Cyclone furnaces will operate successfully on natural gas or oil as substitute fuels.

6. There is a saving of power required to prepare coal for firing; however, the increase in forced draft fan power more than offsets the saving in crusher power.

7. Cyclone furnaces have not decreased the fouling of heat absorbing surfaces when burning Central Illinois coal.

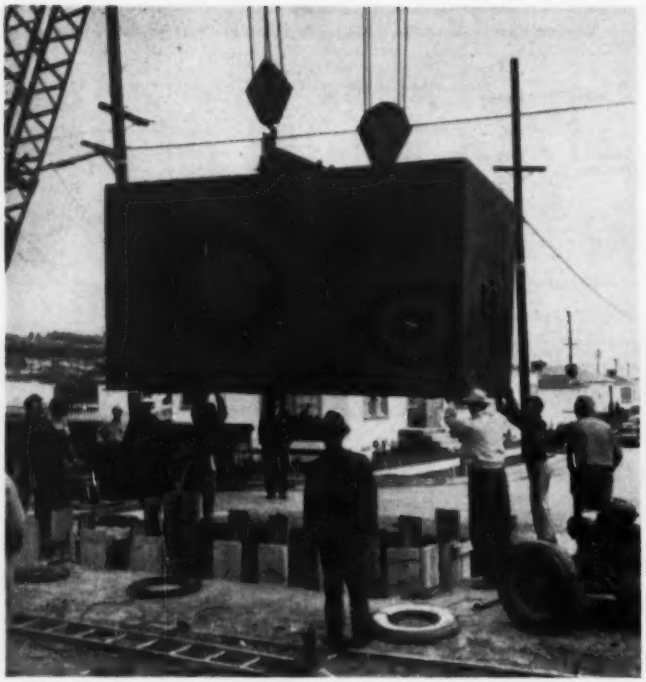
Dust Loading and Collector Performance

Station Unit	Calumet 20-A	Fisk 18	Joliet 5	Ridgeland 2
Furnace Discharge, Guarantee Equivalent Grains/cu ft @ 32 F, 22% Exc. Air	—	0.719	0.719	0.719
Furnace Discharge, Test Grains/Cu Ft @ 32 F, 22% Exc. Air	0.659	0.561	0.665	0.677
Type of Collector	None	Mechanical	None	Electrostatic
Collector Efficiency, Guarantee or Expected, Percent	—	68	—	80
Collector Efficiency, Test, Percent	—	47.9	—	86
Stack Discharge, Grains/Cu Ft @ 32 F, 22% Exc. Air	0.659	0.39	0.665	0.095

Improved

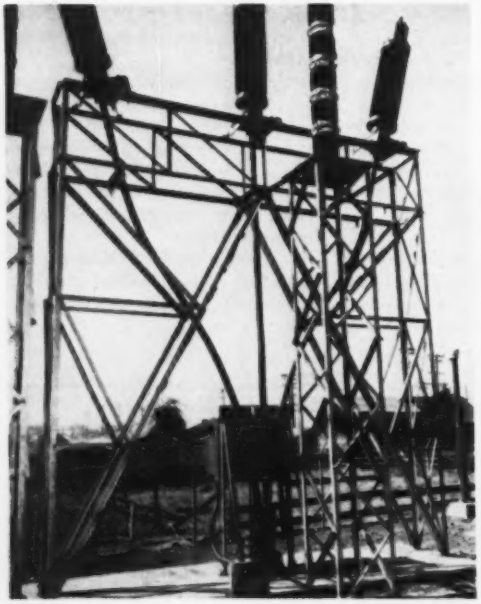
H. T. WELLING,
Supt Gas Distribution

G. R. GEERING
Asst Supt Electrical Distribution
Pacific Gas & Electric Co
Oakland, Calif.



THREE DAY INSTALLATION of precast concrete vaults saved Pacific Gas & Electric time and effort in installing their second major 120-kv, high-pressure, gas-filled pipe type cable. Excavating and placing of shoring required two days. Vault was set in place in one day

TWO PIPE EXITS cast in each end of the vault accommodate the two 5-in. steel pipes. Each pipe carries three 500-mcm conductors

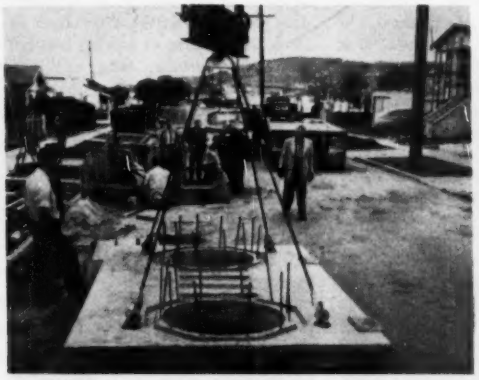


EASY BENDS in copper risers were made by tilting outside terminal bushings. System was pressure tested before cables were installed

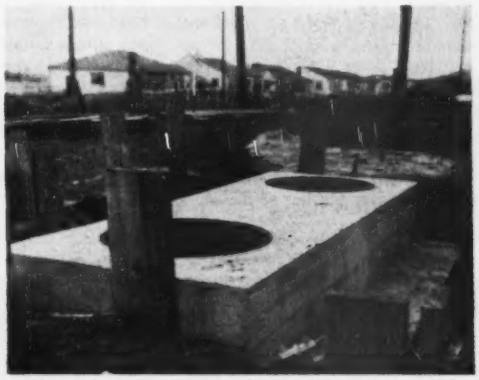
UP AND OVER go cables before being pulled into terminal section. Cables were fed from shipping reels over suspended reels into riser tubes

Techniques Save Time and Effort
In Pipe-Type Cable Job

Simplified terminal design, pre-cast vaults, and longer cable pulls are benefits derived from experience with first pipe-type cable installation in 1948



NECK SECTION was poured using collapsible steel form. This section accommodates grade variations up to 3 ft above vault top and allowed use of one size of vault. Two openings are required for cable pulling



PRE-CAST TOP for vault weighs eight tons. Rectangular neck section to bring manholes to grade is cast on reinforcing rods in the field. Pre-cast top is placed on rods before concrete for neck is poured

Pre-cast concrete vaults, longer cable pulls, and a simplified terminal system were used by Pacific Gas & Electric Co to speed its second major installation of 120-kv high pressure, gas-filled, pipe-type cable. The system was energized in November.

These improvements in installation technique resulted largely from experience with the first western installation of this type cable, 18 circuit miles of 1,000,000-cir mils cable in four circuits in San Francisco (EW, Aug. 28, 1948). The primary benefit of these improvements was to facilitate the work—cut the time required for vault construction, decrease the number of vaults, and ease terminal installation problems.

The second pipe-type installation was made on the outer side of San Francisco Bay. It is intended to carry power about 4 miles from a receiving substation to a new station built to serve rapidly expanding industrial loads in Richmond.

Two 500-mcm, three-conductor cables in separate 5-in., somastic covered steel pipes laid in the same trench were chosen for the job. Either circuit is capable of carrying the full load required to serve the substation. With one circuit acting as standby for the other, the two circuits will provide the high degree of reliability required.

Pre-cast vaults accomplished a substantial time saving during construction. Contrasted to a total time of three weeks to one month for forming, pouring, and curing vaults in place, the precast units required only three days. Crews dug the hole and installed shoring in two days, placed the 16-ton lower piece (bottom and four sides) and 8-ton top piece on the third. After placing the top piece they set up a collapsible steel form to pour a rectangular neck section above the two circular holes, bringing them up as much as three feet to grade. The street could be reopened to traffic shortly after this neck section was poured.

All 11 of the vaults used were pre-cast with the same inside dimensions —7⅓ x 12½ x 7-ft deep. Two holes at each end provide for entrance and exit of the two pipes. A knockout section in the bottom permitted installation of a sump pump where required although, being cast in one piece, the vaults are watertight. Two sections of Unistrut cast in the ceiling provide overhead support for blocks to lift and hold cable and pipe during splicing or future maintenance.

After a vault was in place the two pipes were run straight through it at grade. The trench was filled for 100 ft each way from the vaults and the pipe cut off and capped with about four ft extending into the vault. Pipe sections from vault to vault were tested for leaks at 100 psi of air over a 48 hour period, then capped with an end casing.

Longer cable pulls resulted from the combination of experience from the earlier job and a route over favorably flat terrain with few bends. Seven of the ten pulls per circuit were

over 2,000 ft, the longest being 2,560 ft. Tensions measured by a special tension indicator (EW, Aug. 28, 1948) reached 10,350 lb, safely under the 12,000-lb maximum specified by the manufacturer for three conductors.

Although the route was fairly straight and level, it included crossings under a state highway, the mainline of one railroad, and two separate tracks of a second. In each case a 12-in. casing was forced under the crossing behind a hydraulic borer, and the two pipes pushed through the casing. The casing was then filled with a mixture of 95% mud and 5% concrete to provide better heat distribution with the cable in operation. Mechanical protection for the somastic coating of other sections of the pipe is provided by loam—a 3-in. layer on the bottom and sides of the trench, with 6 in. over the top of the pipes.

Terminal arrangement was planned to facilitate pulling in the cable and to allow complete pressure testing of the copper riser pipe and spreader head assembly before the terminal length of cable was pulled in. Eight-inch pipe was used in the section from the station manhole to the terminal spreader head to allow for thermal expansion of the cable and to simplify spreader head construction and mechanical problems of placing and phasing out the cable. Three lengths of copper tubing connect the spreader head with the terminal bushings. The two outside bushings were installed at an angle of 15 deg from the vertical to keep bends to a minimum. This complete system was tested at 230 psi before the cable-pulling operation was begun.

Three empty reels were suspended above the entrance to the tubing so the cable could be carried up from the shipping reels and over them to enter the tubing from above. All three cables were pulled at the same time, with enough difference in their starting positions so the three ends would follow in sequence through the pipe, taking into account the difference in length of the two outer tubes from the center one.

This proved to be a much easier method than bringing the cable up through the pipe, then threading the terminal tubing over it, as had been done on the original installation in 1948. All welding or brazing between the tubing spreader head and steel pipe was completed before the cable was in place. This eliminated any need for fin-type welds or other devices to distribute heat because the cable was not in place to be damaged by heat during such welds or brazing.

CLAMP AT TIE-WELD prevents longitudinal movement while pipe is being rolled during welding operation. Up to 700 ft of pipe have been rolled as a unit on this installation

BELL AND SPIGOT JOINT for 120-kv cable line eliminates rough surface at inner joint

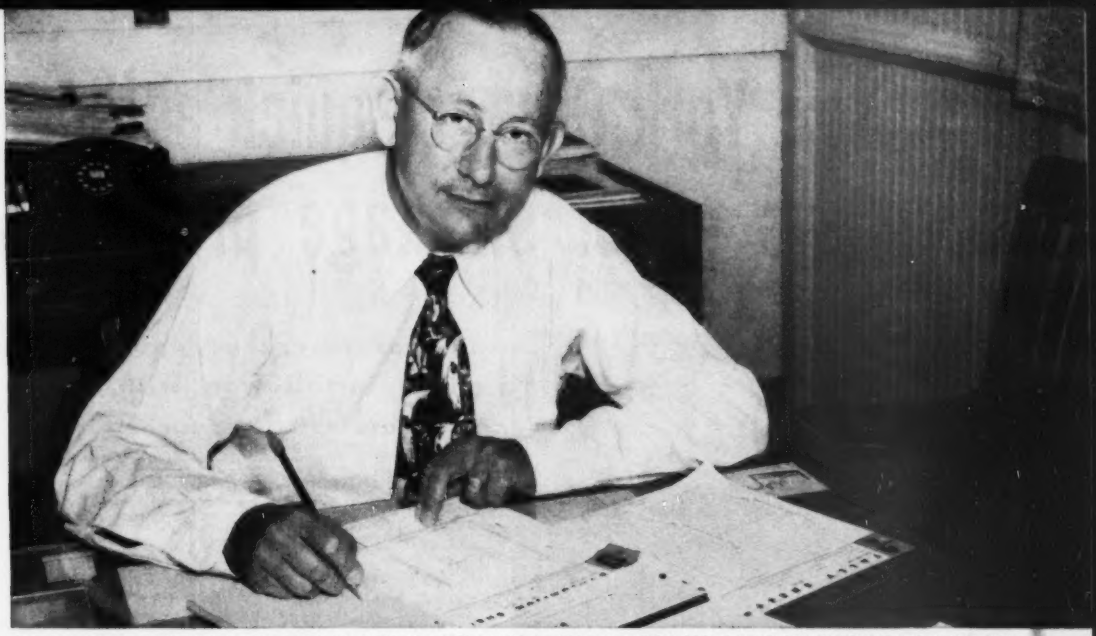
Bell and Spigot Joint Aids Pipe-Type Cable Installation

W. D. McCULLY, Engineer
Underground Lines Dept
Detroit Edison Co

A unique type of welded joint is used by Detroit Edison Co in the construction of 8-in. cable pipe lines. One end of each ¼-in. wall, double random pipe lengths is belled at the mill to an inner diameter roughly 1/16-in. larger than the outer diameter for a distance of 2¼-in. The transition section is approximately 2-in. long. Pipe lengths are joined together by a gas fillet weld at the end of the bell.

A number of considerations led to the adoption of this type of joint. It eliminated the possibility of welding beads or icicles on the inner surface of the pipe. Also, by ordering a small percentage of the pipe belled at each end, a method was provided for joining cut-to-length sections, a distinct advantage over the double-bevel chill-ring type of joint.

The bell and spigot joint has proven to be very convenient for assembling and lining up in the trench. Pipe sections are lowered into position by crane and a rubber-belt sling. The spigot is entered into the bell of the last laid section. Roller assemblies are placed to support the pipe at the bell and at the midpoint of each length. This system permits easy rolling of up to 700 ft of pipe during welding operations, all welds being "roll" welds except at curved sections and at the tie weld between successive days of pipelaying.



MR. A. D. IRION, ASSISTANT SUPERINTENDENT OF SHOP AND TEST DIVISION, USES EVALUATION FORMS TO EASILY DETERMINE BAR X AND SIGMA.

Southern California Edison Adopts Meter Accuracy Evaluation Method

I-50 CERTIFICATION MEANS that meters are factory-certified within these limits: Bar X within ±0.1% and Sigma within 0.15% on full load and 0.20% on light load. Also, 99.9% free from defects that might cause improper registration or operation.

Southern California Edison Company, which has recently installed its one millionth meter, is now using the Bar X (average accuracy) and Sigma (accuracy distribution) method of evaluating the accuracy of groups of meters. According to Mr. F. A. Redding, Superintendent of Edison's Shop and Test Division, this method has proven highly satisfactory.

REPORTS A.D. IRION, "The Bar X and Sigma method not only is a valuable tool to the meter engineer but also is an indirect method of checking the standards used in meter testing. Comparison of evaluation data from time to time provides a simple means of analyzing accuracies which can only be made by other long and tedious obsolete methods. Computations can readily be made on groups of meters in a minimum amount of time."

FOR COMPLETE INFORMATION, call your G-E representative or write for bulletin GED-1408; Section 601-82, General Electric Company, Schenectady 5, New York.

SEND TODAY FOR COMPLETE SET OF METER EVALUATION FORMS

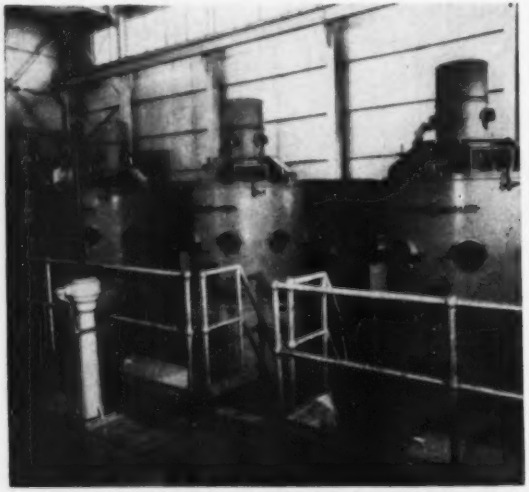
Section 601-82
General Electric Co.
Schenectady 5, N. Y.

Please send me a set of evaluation forms (GEZ-332) ☐
plus a descriptive brochure (GED-1408). ☐

NAME _____ POSITION _____
COMPANY _____
ADDRESS _____
CITY _____ STATE _____

GENERAL ELECTRIC

How New York City got quick action to relieve water shortage problem



Pumps operated by six G-E 2500-hp 4000-volt synchronous motors can supply 100 million gallons of Hudson River water daily. Station was designed as an emergency stand-by unit to operate only in event of water shortage pending completion of city's mammoth, war-delayed Delaware Aqueduct project.

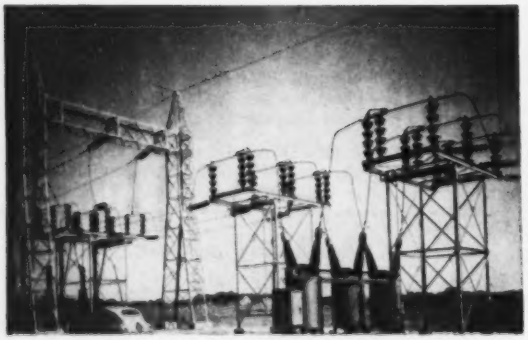
Speeds emergency pumping plant installation with G-E Standardized Outdoor Station

Speed and reliability were the watchwords when New York City decided to erect a Hudson River pumping plant to guard against a possible repetition of the 1949-50 water shortage.

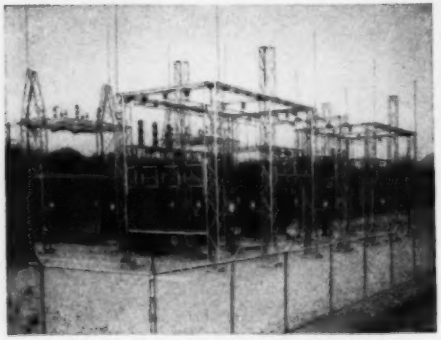
To operate the plant, a 15,000-kva outdoor substation was required. By deciding on a predesigned standardized substation, supplied as a complete package including the structure, New York City saved months of detailed engineering, cut delivery and installation time and had the station ready for operation within 9 months after signing the contract. What's more, taxpayers were saved money.

All motors, control and power substation equipment were co-ordinated by G.E. as a project—thereby saving more time since all responsibility for manufacturing and expediting was placed in the hands of one dependable manufacturer. *General Electric Company, Schenectady 5, N. Y.*

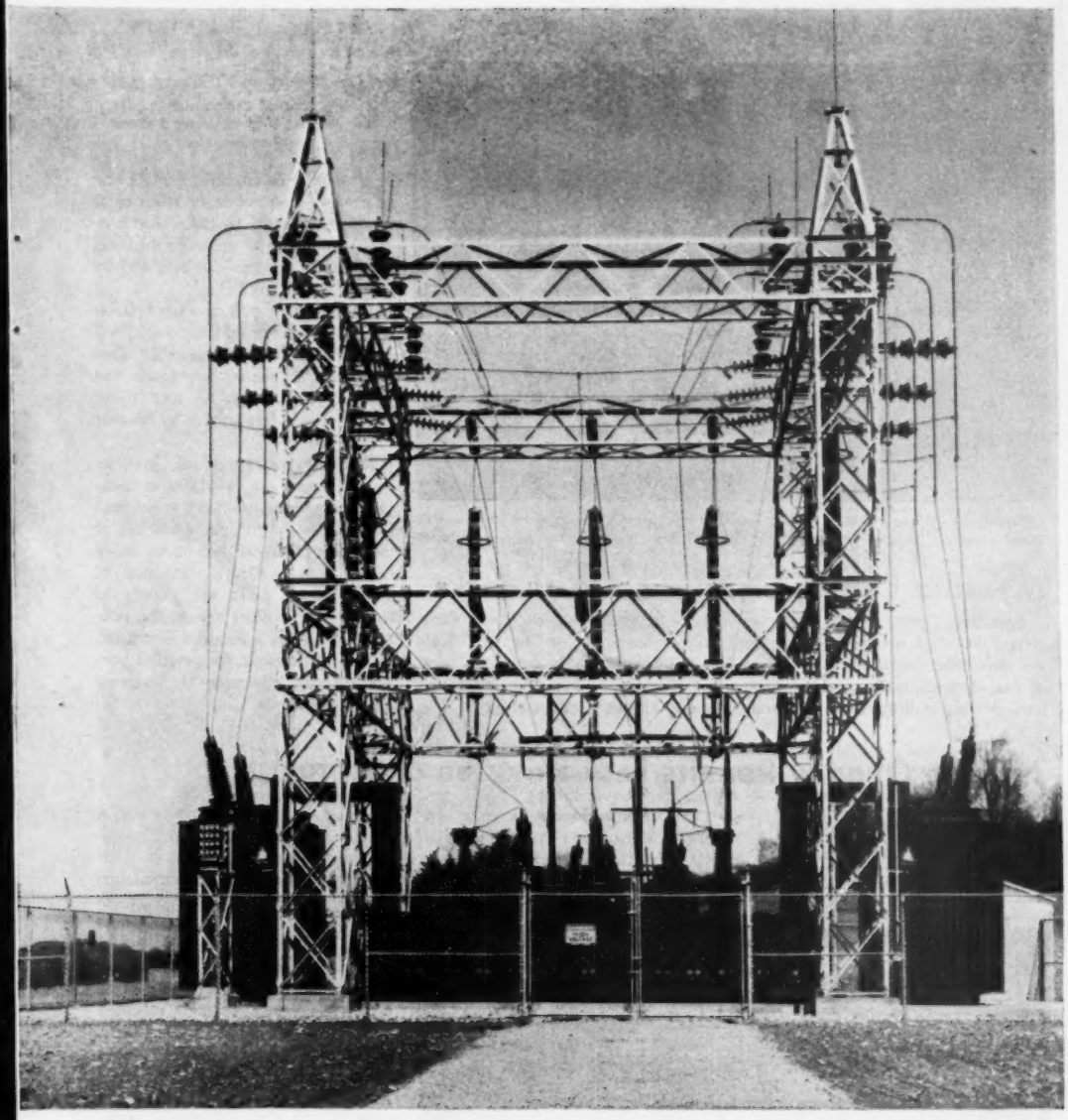
Standardization is modern trend for utilities, too



161-KV STATION erected by St. Joseph Light and Power Co., Marysville, Mo., is example of growing use of standardized equipment in electric utility expansion programs. Entire station, including steelwork, disconnecting switches, breakers, etc., was supplied by General Electric.



CINCINNATI GAS & ELECTRIC CO. MIDWAY STATION constructed entirely of G-E standardized units, including latticed columns and trusses. G-E standardized equipment is available for all ratings from 7.5 to 230 kv.



Everything Standard—including the structure

STANDARDIZED OUTDOOR SUBSTATION for Hudson River pumping station is rated 15,000-kva, 110-kv to 4.16-kv, 3-phase, 60-cycle. Includes two 7500-kva power transformers, outdoor circuit breaker and low voltage metal enclosed switchgear. Supplied as a "package," including standardized steel structure.

For information on similar equipment, write for Bulletins GEA-5573 Standardized Structures, GEA-1040 Power Transformers, GEA-4985, GEA-1642 and GEA-4407 Oil Circuit Breakers, GEA-4980 RF Disconnecting Switches.

GENERAL ELECTRIC

851-8

PRESSURE GAUGES on hydraulic jacks measure pulling tension on underground cable as it is being reeled in. Jacks are put under rear of truck; take up half the load on rear tires

Measure Cable Pull Tension With Jacks

H. H. COX
Supt of Distribution
Los Angeles Dept of Water & Power
Los Angeles, Calif.

Hydraulic jacks with pressure gauges attached are being used by the Department of Water and Power of Los Angeles to determine pulling tension when pulling in long sections of underground cable. Jacks have been substituted for the two "stiff legs" formerly placed under the back end of the cable-pulling truck to steady it during the operation.

A method of checking pulling tension was found necessary when cable was being pulled in older duct systems. Diameter of the older duct was substandard for the size of cable being pulled.

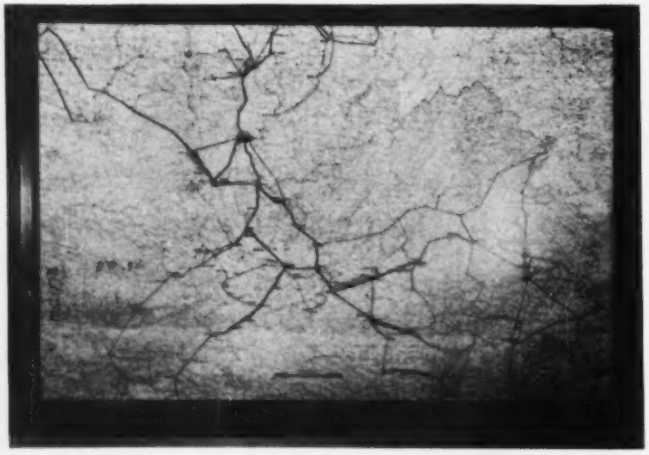
In measuring pull, the truck is set over the hole so that the cable will be as nearly vertical as possible. Two jacks are set under the truck and pumped up enough to take about half the load being carried by the rear tires.

Reading points on the pressure gauges, which are calibrated in thousands of pounds, are taken as the zero reference point for pulling. Sum of the readings of the two jacks above this reference, plus a correction of 10% because jacks are slightly in front of the vertical axis of the pulling cable, gives a measure of tension sufficiently accurate for practical purposes during the time the cable is being installed.

Acetate Overlay Permits Easy Revision of System Map

T. M. ROBERTS
System Civil Engineering Dept
Appalachian Electric Power Co
Roanoke, Virginia

The engineering department recently constructed a system wall map that permits unlimited revision and rearrangement. Unlike the usual system map, it consists of two layers: A base map giving the usual geographical information; a transparent overlay on which are drawn transmission lines, plants and other necessary information. This combination gives the impression that system components are drawn directly on the map.



SYSTEM MAP on back of acetate overlay may be revised by removing overlay, making erasures with a damp cloth, and making the latest revisions in either pen or pencil

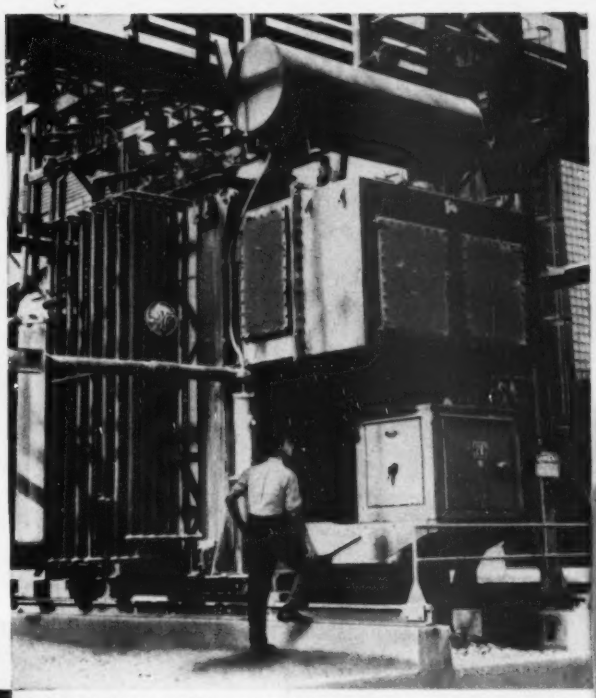
The specific map consists of a mosaic of several state maps mounted on ¼-in. plywood. U. S. Geological Survey maps with a scale of 1:500,000 are used. The plywood was given rigidity by mounting it on a frame made of 1 x 2-in. yellow-pine strips glued and nailed to the backside, and by diagonal stiffeners glued in place.

The overlay was prepared on transparent 0.01-in. Graftint Mattex acetate obtainable in widths up to 40 in. and in 12-ft rolls. One surface of the acetate is frosted and suitable for either ink or pencil lines; the other surface is glossy. Lines were drawn on the frosted surface of the overlay which was mounted over the map with the glossy side exposed to pro-

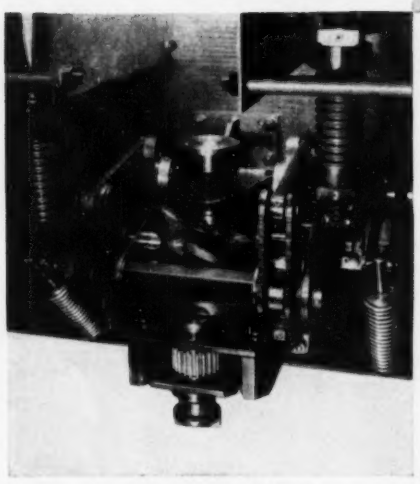
(*Continued on page* 126)

No appreciable mechanical wear after 1,017,706 tap changes

G-E load-ratio-control averages 800 tap changes a day at Alcoa plant



G-E LOAD-RATIO-CONTROL TRANSFORMER rated 40,000 kva (output) 13.8 kv, installed at Alcoa's Vancouver plant, provides ±5% voltage regulation.



MILLIONS OF TROUBLE-FREE OPERATIONS are built into this hardened steel cam assembly—typical of the mechanical strength of G-E load-ratio-control. Each new LRC design must pass mechanical-life tests of several million operations before it can be approved for production.

The load-ratio-control equipment on this transformer really has to "take it." Installed on January 16, 1946, it has already completed more than a million tap changes under load! At its last inspection on January 17, 1951, Alcoa found the LRC mechanism in excellent working order. None of the mechanical parts—bearings, pins, cam rollers or cam surfaces—showed appreciable wear.

Without a rugged mechanical system, the toughest electrical parts would be worthless. That's why every new LRC design must pass mechanical-life tests equal to at least 30 or 40 years of ordinary service!

Requires less routine maintenance, too!

With G-E load-ratio-control, you don't do any *unnecessary* service work. The instruction book which accompanies each unit tells how many operations you can expect the LRC equipment to perform before you have to replace contact tips and clean insulation.

This means you can eliminate unnecessary inspections. Simply refer to the instruction book and read the operations counter to schedule maintenance only when it is needed!

Over 39,000,000 installed kva have proved that General Electric LRC is as reliable as the core and coils themselves.

General Electric Company, Schenectady 5, New York.

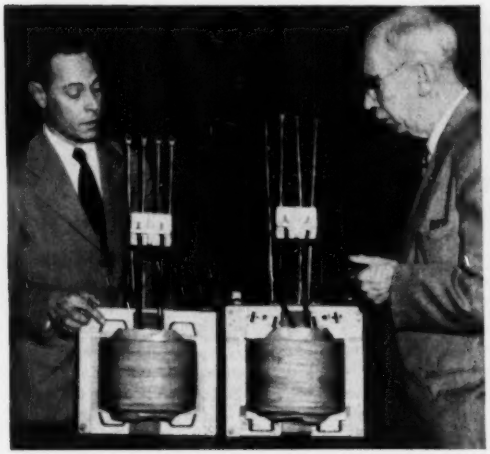
401-22

GENERAL ELECTRIC

Now...new design makes G-E pole-type

LESS WEIGHT ON POLE. C. E. Sutton, Jr., Manager of Distribution Transformer Sales, points out material which will not have to be hung on pole, thanks to new design.

transformers even lighter, stronger



STRONGER, THOUGH LIGHTER INTERIORS result from improved clamping structures and coil supports. N. M. Case, Section Engineer, and E. D. Treanor, Manager Distribution Transformer Engineering, examine simple two-channel clamp with welded cross braces which replaces four-angle structure with bolted cross braces on unit at right.

WHAT FOUR WEIGHT REDUCTIONS HAVE MEANT. Unit on left is a pre-Spirakore distribution transformer. It weighs 505 pounds. It has an over-all height of 39 inches. Projected floor space is 21 by 22 inches. Comparable Spirakore unit on right weighs 335 pounds. Its over-all height is 35 inches. Projected floor space is 18½ by 20¾ inches.

Low losses retained — regulation improved — as Spirakore* transformer design chalks up fourth weight reduction

General Electric has again made important improvements in the quality of its core steel and its processing methods, permitting the redesign of most of its pole-type distribution transformers. The resulting copper savings are enough to build seven transformers where we could previously build only six.

Substantial weight reduction. The new units retain the low losses and high thermal capacity to take overloads, characteristic of previous designs. They also offer lower impedances, resulting in improved regulation. Physically, they're stronger than previous designs. Yet, they weigh substantially less:

AVERAGE REDUCTION IN MATERIALS WITH THE NEW DESIGN

(5000 volts and below)

- **10% reduction in total weight**
- **16% reduction in copper**
- **9% reduction in oil**
- **3% reduction in steel**

On a 2400-volt, 37½-kva unit the weight reduction amounts to 100 pounds. This means enough copper is saved to build a new-design 5-kva unit and enough oil for a new-design 10-kva unit.

Greater Short-circuit Strength. In the new design, clamping structures and coil supports have been simplified. . . strengthened. Support structures stay tight throughout treatment and life of the transformer. Tight coil supports prevent slippage between high- and low-voltage coils—increase short-circuit strength materially.

Continued leadership. The new design represents another of the many improvements that have helped maintain Spirakore transformer leadership since 1937. High impulse strength, Nitrile rubber gasket sealing, and long-life Melaglyp paint finish are some of the reasons why Spirakore transformers give extra years of service.

For complete information on these units write for GEA-4885, *General Electric Co., Schenectady 5, N. Y.*

*Registered trade-mark of the General Electric Co.

Spirakore transformers give extra years of service.

413-118

GENERAL ELECTRIC

Map Overlay

(*Continued from page* 122)

tect the drafting. Wood molding along the edges holds the overlay in position.

When revisions are necessary, the overlay is removed, erasures made with a damp cloth, and additions made with either ink or pencil. The acetate will withstand extensive erasures without damage.

This map is ideal for conferences or "pencil talks," because the exposed glossy surface may be marked with a china marking pencil (any color) and erased with a damp cloth without affecting the system map.

The cost of one 72 x 40-in. map representing nine states was $55, including nine U.S.G.S. maps, reinforced plywood frame with moulding, acetate overlay, and labor of mounting the maps. Drafting cost is not included in this total.

Cost of plywood frame and labor of mounting the maps jointly constituted more than 80% of the total expense. The acetate cost only $5 and the nine U.S.G.S. maps $2.25.

Test Distribution Lightning Arresters in 5 Minutes

E. R. COOP
Asst District Engineer
Narragansett Electric Co
Providence, R. I.

Speed of operation and safety in testing are combined in a lightning arrester test unit used by Narragansett Electric Co to test arresters from the field. Less than 5 min per arrester is required to make withstand, breakdown and leakage maintenance tests on 3-kv distribution type units. Safety during testing is provided by a transite housing which encloses all high-voltage equipment and the arrester testing compartment. A door to this compartment operates a switch which deenergizes the equipment when the door is open.

Test unit is supplied at 115 v through a 15-amp single-pole thermal circuit breaker for overload protection. Supply voltage is controlled by a variable ratio autotransformer rated at 1 amp and 0 to 135 v. A double-scale voltmeter (50 or 150 v full-scale) in the low-voltage system gives a sufficiently accurate indication of test voltage.

High voltage is supplied by an 11,500-115-v, 400-va potential transformer, in series with a 3-megohm wire-wound resistor which limits the current during breakdown. Current through the arrester under test is indicated in two ways: A neon glow lamp with a resistance shunt to indicate arrester breakdown; a 250-μamp rectifier type instrument to measure leakage current at normal operating voltage. Selector switch for these two indicating devices is of a type which always maintains a circuit. All equipment is inclosed in a transite housing measuring about 30x30x28 in.

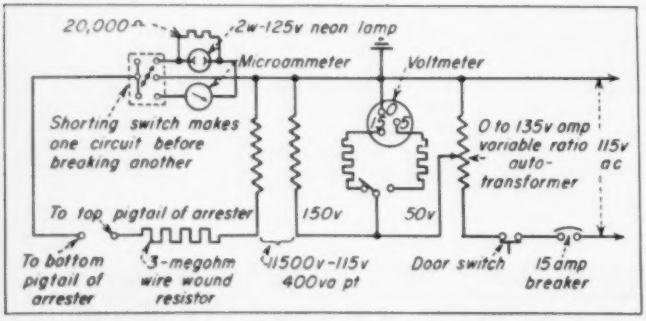
Before all tests a check is made to insure that the supply switch is open and the autotransformer set at zero. After the arrester is mounted in the cabinet and connected, the voltmeter is switched to the high scale and the test indicator is switched to the neon lamp position. The supply switch is then closed and the voltage increased slowly to the withstand value of 4.5 kv. If the neon lamp flashes at or before the withstand value, the arrester is discarded. In such case, the voltage is returned to zero, the supply switch opened, and the arrester removed.

If the arrester does not break down below 4.5 kv, the withstand test goes forward until the neon lamp flashes. At this point the breakdown voltage is noted, and the test voltage is immediately returned to zero so as not to damage the arrester. The voltmeter reading at the time the neon lamp flashed should be under 12 kv. Arresters which do not breakdown below 12 kv are discarded without further test.

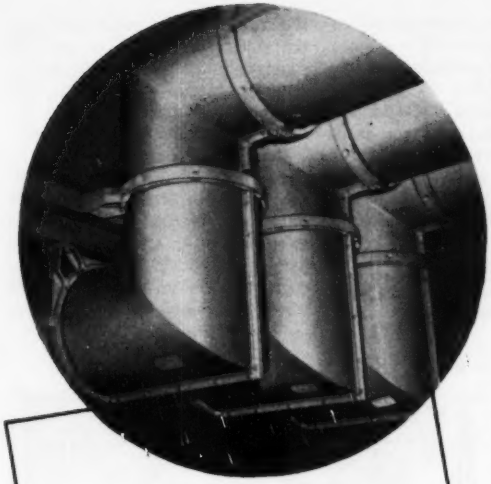
Before proceeding with the next test, the test voltage should be zero and the supply switch closed. The voltmeter is switched to low scale and the test indicator is switched to the microamps position. Requirements are that applied voltage shall never exceed 2.4 kv, and that leakage current shall not exceed 35 μamp. If

Testing of Arresters During 11½ Months Gave These Results

Type	Withstand Test			Breakdown Test			Leakage Test	
	Number Tested	Passed	Failed	Under 8 kv	8 to 12 kv	Over 12 kv	Under 25 μamp	Over 25 μamp
A	4	4	—	1	1	2	2	—
B	52	50	2	10	34	6	39	5
C	7	6	1	—	5	1	5	—
D	53	45	8	—	33	12	33	—
E	7	7	—	—	5	2	5	—
F	15	11	4	6	4	1	—	10
G	8	6	2	5	—	1	4	1
H	13	11	2	10	1	—	9	2
I	108	94	14	13	65	16	63	15
J	150	147	3	8	120	19	121	7
K	144	141	3	25	107	9	131	1
Totals	561	522	39	78	375	69	412	41



TEST UNIT for checking 3-kv distribution type lightning arresters returned from the field permits quick operation and provides a maximum degree of safety for the test operator



EASY does it

Unsolicited letters from many of Delta-Star's customers prove that Delta-Star's close attention to details in designing and assembling metal-enclosed bus structures has paid off in reducing cost of installation.

This is true because all details are carefully checked by factory assembly and tests before shipment. The entire bus and enclosures are carefully marked to assure accurate alignment and ease in locating component parts. Being factory engineered and tested to meet specific requirements both electrically as well as structurally a minimum of set-up, fitting, checking, and testing is required.

Delta-Star designs and builds isolated-phase, metal-enclosed busses for voltages to 23,000V and current ratings to 7,000 amperes. Segregated and non-segregated-phase busses are also manufactured.

PROTECT YOUR INVESTMENT

Although metal-enclosed bus runs are now used extensively for generator connections, there are many other places where it is necessary to tie in large blocks of power at comparatively low voltages involving heavy ampere capacities. Here DELTA-STAR Metal enclosed buses can be used advantageously because of their low installation costs.

When you want the best in high voltage switching equipment, specify Delta Star

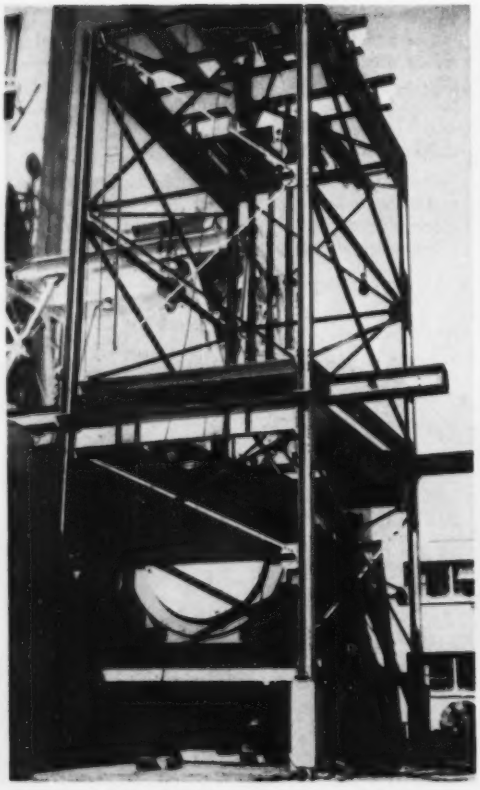
DELTA-STAR ELECTRIC COMPANY
DIVISION OF H. K. PORTER COMPANY, INC.
2437 Fulton Street • Chicago 12, Illinois
DISTRICT OFFICES IN PRINCIPAL CITIES

ARRESTER CUBICLE is protected by door switch which deenergizes unit when door is open. Unit combines fast testing with safety

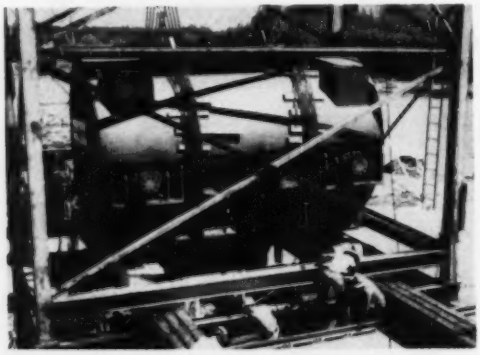
the current exceeds this value before 2.4 kv is reached, the test is at once concluded and the arrester discarded.

The leakage current test calls for increasing the potential to 2.4 kv and maintaining the value for 1 min. During this period arrester leakage currents of 25 μamp or less are acceptable. Above this value, leakage is considered excessive and the arrester is discarded. At the end of the minute the voltage is reduced to zero, the supply switch opened and the arrester removed. Arresters that meet requirements of all three tests are stored for future service.

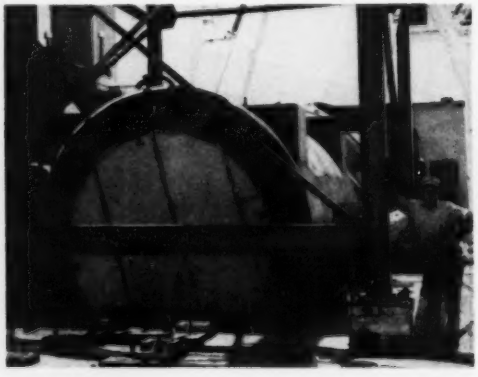
Quantity of units tested has required only occasional attention by one man. No accidents have been associated with the equipment. Requirements of speed and safety have been satisfied and reinstallation of many arresters that probably would have caused trouble has been obviated.



Up goes generator stator . . .



to slide along I-beams toward . . .



position over generator pit

Lift a Stator by Its Bootstraps

G. W. JONES, Construction Supt, Ebasco Services

Installing the stator of a large generator in this station was facilitated by using a temporary steel framework at the construction site. Use of this framework reduced the size of the crane needed to hoist the stator up to its position over the generator pit.

After stator was raised to platform height by two small electric hoists, protruding I-beams were slipped under it. The stator and the upper section of the framework were then slid along on I-beams and greased plates toward generator pit. Once in position over the pit, the steel framework was blocked up on the concrete deck so that the stator could be raised and the I-beams freed. The final operation was lowering the stator over the hold down bolts and dismantling the framework.

Foresight TODAY Saves Dollars TOMORROW

By building all new distribution deadends with two six-inch suspension insulators rather than one, you will be ready for inevitable primary distribution voltage increases. The slight extra first cost will be repaid many times over when higher voltage becomes necessary. Labor and line truck costs of adding the necessary extra insulator later will far exceed the value of that insulator.

Deadends, so built, appeal to economy-minded men, since this part of their system then stands ready for any increase up to 12 kv without further attention or expense. Contact your local Graybar dealer and tell him you want two O-B six-inch suspension insulators for each deadend. Foresight today will save dollars tomorrow.

Ohio Brass

MANSFIELD • OHIO

4217-H

Span Length Limitations for Tangent And Corner Structures

Data are provided for maximum span lengths limited by conductor spacing of three conductors on structures for line angles of 0-15 deg; an adaptation from construction standards of Consumers Power Co.

Tangent and Angle Structures—Line Angles 0-15 deg

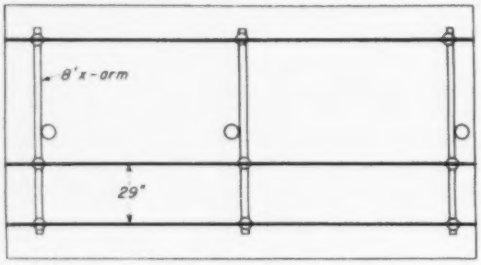


Fig 1—Average mid-span horizontal spacing = 29 in. Maximum span lengths for conductors on 8-ft crossarm
No. 2 ACSR (7/1), 370 ft
No. 1/0 ACSR, 400 ft

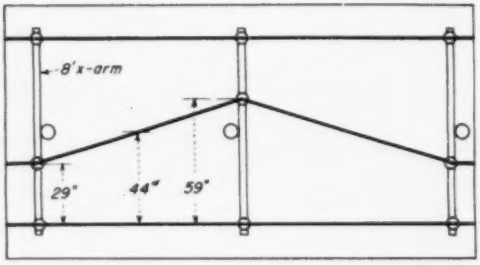


Fig 2—Average mid-span horizontal spacing = 44 in. Maximum span lengths for conductors on 8-ft crossarm
No. 2 ACSR (7/1), 460 ft
No. 1/0 ACSR, 490 ft

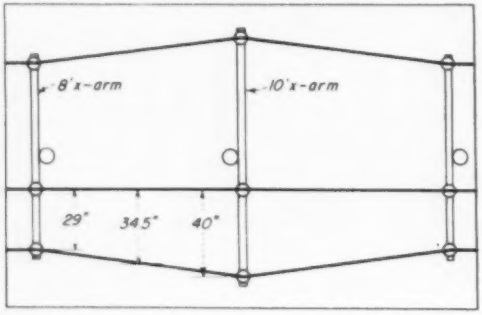


Fig 3—Average mid-span horizontal spacing = 34.5 in. Maximum span length for conductors on crossarms shown
No. 2 ACSR (7/1), 400 ft
No. 1/0 ACSR, 430 ft

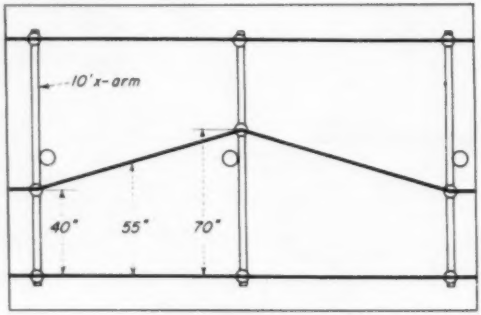


Fig 4—Average mid-span horizontal spacing = 55 in. Maximum span lengths for conductors on 10-ft crossarm
No. 2 ACSR (7/1), 510 ft
No. 1/0 ACSR, 550 ft

Note: Similar data for split angle construction (angles 15-60 deg) and dead ends (angles 60-90 deg) will appear in an ensuing issue.

You pay LESS for Pennsylvania Standard Parts Power Transformers

This shipment cost the purchaser $3,096 dollars less . . . a savings of $516 per transformer.

6-2,000 Kva, 1 phase, 60 C., 55° C., OA, OUTDOOR, — H. V. : 13,800 Volts.
Full capacity taps for 14,400, 14,100, 13,500, and 13,200 volts. — L. V. : 2400/4160Y Volts.
Inert gas — oil seal.

WHY

Standard Parts Power Transformers Can Be Sold For Less

Standard Parts Power Transformers can be purchased at worthwhile savings because of quantity production of standard parts produced with adequate tools and equipment. This has improved the quality of the workmanship, reduced the possibility of errors, and permitted more rigid inspection during the various stages of production. These factors, together with reduced production time, have shown a cost saving which has been passed on to the user.

A considerable amount of money was saved in the purchase of these transformers because the purchaser's requirements — mechanical and electrical — fitted into Pennsylvania's Standard Parts Power Transformer program.

Standard Parts Power Transformers are single phase transformers in sizes up to 5,000 Kva, 69 Kv; and three phase transformers in sizes up to 10,000 Kva, 69 Kv, which have standard or optional voltage ratings and standard or optional accessories. The type of oil preservation method familiar to the purchaser's operating personnel is supplied on these transformers — gas-oil seal, sealed tank, inert gas pressure, or expansion tank system.

Pennsylvania TRANSFORMERS

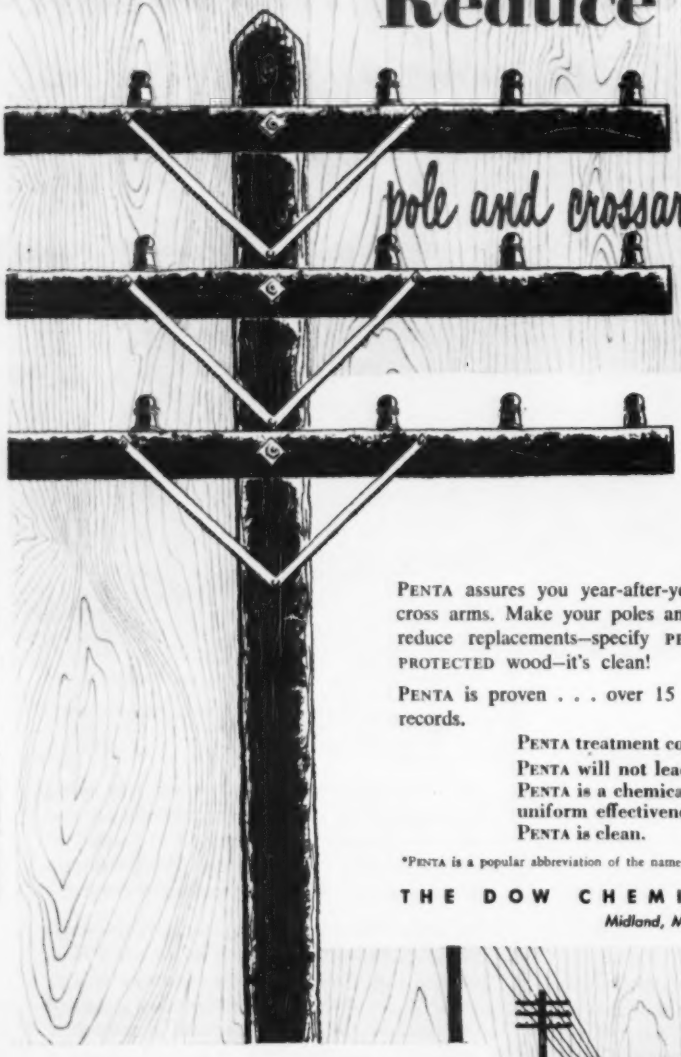
Pennsylvania TRANSFORMER COMPANY

Canonsburg, Pennsylvania — Greater Pittsburgh District

Reduce

pole and crossarm replacement with

Penta*



PENTA assures you year-after-year protection for poles and cross arms. Make your poles and cross arms last longer and reduce replacements—specify PENTA! Linemen like PENTA-PROTECTED wood—it's clean!

PENTA is proven . . . over 15 years of unsurpassed service records.

PENTA treatment costs no more.
PENTA will not leach.
PENTA is a chemical of constant, uniform effectiveness.
PENTA is clean.

*PENTA is a popular abbreviation of the name of the chemical PENTAchlorophenol.

THE DOW CHEMICAL COMPANY
Midland, Michigan

Write *for Dow's free booklet, "Pointers on Penta"*

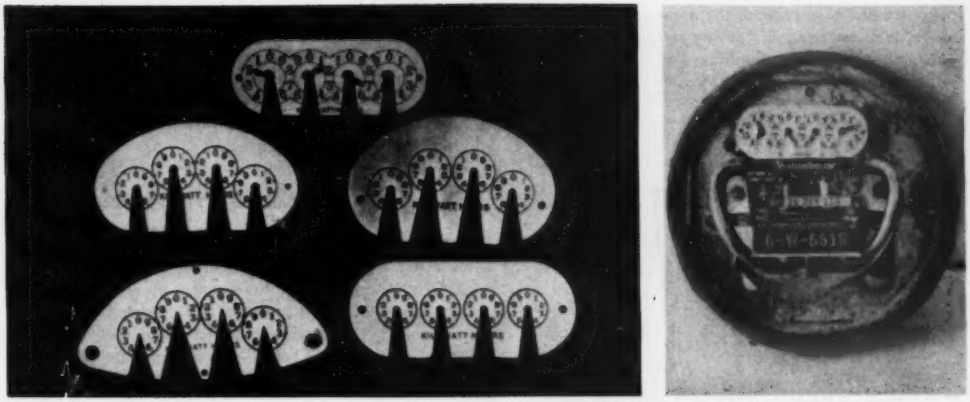
The Dow Chemical Company
Dept. PS-36A
Midland, Michigan

Name _____ Title _____

Company _____

Address _____

City _____ State _____



DAMAGED METER may be read accurately through the use of one of five modified dial faces which can be slipped over the hands

Read Damaged Meters With Modified Dial Faces

Modified watthour meter dial faces are being used to read damaged dials. They are slipped under the hands and over the damaged dial face. This does not disturb the positions of the hands so that accurate readings can be obtained.

B. R. CURRENCE
Meterman "A"
Appalachian Electric Power Co
Charleston, West Virginia

Frequently watthour meters are so badly damaged by fire or other causes that it is difficult to obtain accurate readings. Solution to this reading problem is an extra register face for each type of watthour meter and modified as shown. Wedges cut out of the bottom of the dial face up to the shaft holes allow the face to be slipped over the hands.

"Load Lugger" Handles Large Reels of Cable

Union Electric Company's new "load lugger" is a specially designed piece of equipment for handling and hauling cables and very large cable reels. The lugger unit is mounted on a tandem-axle chassis. This vehicle has a 35,000 lb gross capacity and can pick up and carry reels that weigh up to 10 tons. It is hydraulically operated and lifts reels 96 in. in diameter and 68 in. in width.

Two ratcheted-type jacks located at the rear and on either side of the unit are lowered during loading. The jacks help take some of the unusually great weight off the rear wheels while the reel is being hoisted aboard. Formerly, from seven to eight men were required to get the heavy reels unloaded. With the new equipment, two men can get the job done safely.

Recently the new unit was utilized in laying cable in an open trench installation at the Lambert Municipal Airport near St. Louis. On this particular job, in addition to picking up and carrying the huge reels, the Lugger was driven along the excavation and the cable was payed off directly into the trench.

Not only has the new equipment proven to be a great time and labor saver, but also it has made possible the use of larger capacity reels. The

PAYING OUT CABLE into open trench directly from reel on "Load Lugger" speeds operation. Truck is also used for transporting extra heavy cable reels up to 10 tons in weight

longer lengths have reduced the number of splices required, saving on time and labor. Fewer splices also result in longer service life for the cable. Through the use of reels carrying more cable, it is now possible to keep a smaller number of reels on hand, saving valuable storage space. By installing longer lengths of cable, fewer short ends are accumulated, thereby reducing the amount of cable that is scrapped or duct spliced.

On some recent projects, the Lugger has easily handled reels weighing as much as nine tons, almost twice as much as those formerly used. It performed efficiently carrying reels of 1,000 ft of steel armored cable.

Buckets Speed Material Handling

Dumpster serves three underground projects with its four buckets and takes the place of two or more dump trucks. Truck operates between projects, dropping off an empty bucket and picking up a full one. Tilt-type buckets for fluid materials hold 2 cu yd and drop bottom buckets hold 2½ cu yd. Cleveland Electric Illuminating Co feels equipment has proven economical.

IF YOU LIVE IN WEST HARTFORD
in the area outlined

Your electric service will be interrupted on Sunday, December 23, for about an hour and a half from 6:45 to 8:15 a.m. The inconvenience is necessary to continue the work of connecting the new substation at Frederick Rd. with expanded service for the number of new homes and new building.

This new substation is part of the Company's construction planning to keep ahead of your electric needs and to best serve everyone on its lines.

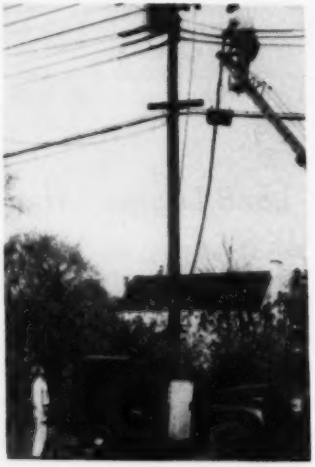
Use Map to Announce Interruption

Public relations were strengthened by unusual announcement of a scheduled interruption planned by Hartford Electric Light Co. The announcement eliminated the need for customers to scan a long list of streets to find out whether their circuits were to be temporarily interrupted.

Mobile Transformer Aids Distribution Service

An electric service van is now available to be rolled up as a stand-in for a damaged neighborhood transformer on the distribution lines of Jersey Central Power & Light Co. This mobile transformer unit was designed by the company's engineers and transportation department and built at the company's Allenhurst, N. J., shops.

The two-wheel, 1-ton emergency unit encloses a 37.5-kva, single-phase, 2,400-120/240-v transformer with a porcelain box fuse cutout.



SERVICE VAN with a 37.5-kva single-phase transformer is an emergency replacement for damaged distribution transformers. Locking doors and insulated cable are safety features

Connections are made by copper cables. Primary cable, 50 ft long, is No. 10 flexible, 5-kv insulation, rubber and neoprene jacket with flexible and grounded metallic shielding braid. Three secondary cables, each 50 ft long, are No. 2/0, 600-v, rubber neoprene, extra flexible.

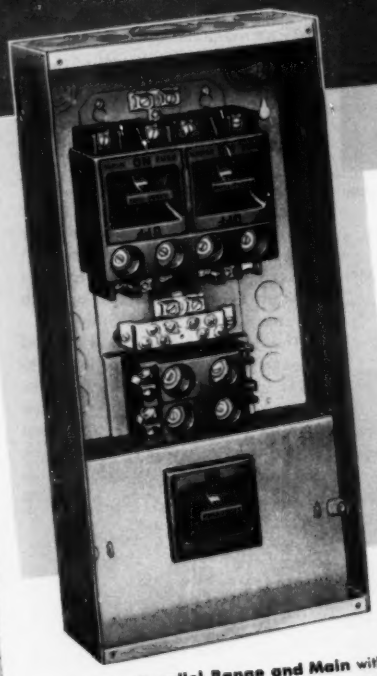
Safety features of the unit include six red lights with reflectors, in addition to the tail light. With the cables insulated and the trailer doors closed and locked, the unit is relatively safe.

How are YOU meeting today's increasing residential loads?

Here's the Simple, Economical

ANSWER

SQUARE D's COMPLETE LINE OF 100 AMPERE FUSIBLE SERVICE ENTRANCE EQUIPMENT PROVIDES ALL THE CIRCUITS IN A SINGLE ENCLOSURE . . . AT LOW COST



above • **Parallel Range and Main** with 4, 6, or 8 plug fuses. Separate water heater circuit may be connected independently and sealed for special utility rates.

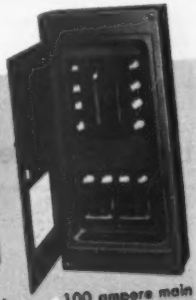
Square D's complete line covers 1 to 16 circuits for lighting. Pullouts are provided for mains, ranges, water heaters and special appliances. Rain-tight enclosures available with Square D's interchangeable hubs. All devices are Underwriters' approved.

EASIER AND FASTER INSTALLATIONS WITH THESE DESIGN LEADERSHIP FEATURES:

- ✓ Solderless terminals—faster wiring connections.
- ✓ "On-the-spot" knockouts—punched and repressed for easy, clean removal.
- ✓ Engineered gutters—generous wiring space for speedy installation and maintenance.
- ✓ Non-interchangeable pullouts—prevent mix-up of fused circuits on a device.

• **Parallel Range and Main** with 4, 6 or 8 plug fuses and water heater or dryer circuit—for average home, all circuits in a single enclosure.

• **Parallel Range and Main** with 4, 6 or 8 plug fuses. Sub-feed connections allow additional circuits—the minimum entrance equipment for the modern home.



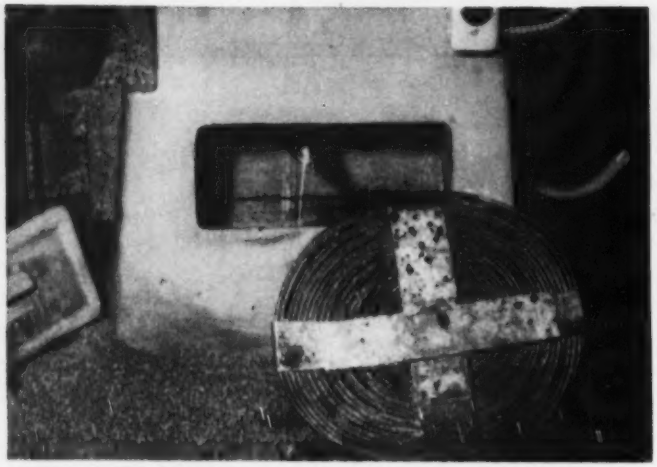
• 100 ampere main pull-out controls range, water heater or dryer, and up to 16 plug fuses. For larger homes, small commercial buildings, radiant heating jobs.

ASK YOUR ELECTRICAL DISTRIBUTOR FOR SQUARE D PRODUCTS

SQUARE D COMPANY

DETROIT • MILWAUKEE • LOS ANGELES

SQUARE D COMPANY CANADA LTD., TORONTO • SQUARE D de MEXICO, S.A., MEXICO CITY, D.F.



PANCAKE HEATING COIL used in automatic saw coolant conservator tank eliminates freezing and changing to light oil during winter.

Electric Heat Saves $57 Monthly

G. W. CRAIGLOW
Industrial Power Engineer
The Ohio Power Co
Canton, Ohio

Electric soil-heating cable has solved a problem and saved money for the Canton Ohio Forge & Axle Works of Poor & Company. To lubricate and cool its automatic saws which cut billets for forging, it uses a coolant, stored in a conservator tank in the bottom of each saw foundation. This is circulated to the saws by pumps and drained by gravity into the conservators for re-use.

This arrangement served well in summer but the coolant in the conservators froze during cold weather because the saws are situated in an unheated part of the building. Each winter it was necessary to replace the coolant with a light-body oil to eliminate freezing. About 160 gal of coolant (comprised of water and 10 gal concentrate) are used per month for the three 10 in. automatic saws. At the time this situation was investigated, the coolant concentrate cost $.507 per gal and the light oil cost $.44 per gal. Based on these figures 10 gal of coolant concentrate costing $5.07 was used per month in summer, and 160 gal of light-grade oil costing $70.40 per month was required during the winter.

To solve the freezing problem more economically, a 400-w pancake coil of lead-covered soil-heating cable was placed in each conservator tank. Each coil contained 60 ft of cable and cost $10.95. Since this installation was made, freezing has been eliminated and the coolant does not have to be replaced by oil in the winter. Power for operating the three heaters 24 hr day, 30 days per month, cost $8.33 per month. These figures show a monthly operating cost saving with the electric heaters of $57.00.

The heating units are connected through fuses directly to the line without a switch so the heat cannot be turned off accidentally by the saw operators. To date this lead-covered heating cable, which was in operation during the last heating season, shows no sign of deterioration. Operation has been satisfactory.

Luminous Ceiling Eliminates Expensive Construction

Luminous Ceilings, Inc

FALSE CEILING construction costs were eliminated by installation of luminous ceiling. Light from existing skylight above augments the daytime intensity

MELVIN G. LEWIS
Bechtel Corp
San Francisco, Cal.

A luminous ceiling has solved an expensive structural problem very economically in the 44 x 96 ft drafting department for the mechanical engineering section of the power plant design division of the Bechtel Corp. San Francisco, Cal. In addition, light from existing skylight above ups the lighting intensity during daytime hours.

This installation eliminated the necessity of building a structural false ceiling in this room which has a skylight-equipped 25-ft high ceiling. Approximately 4200 sq ft of ceiling area has 180 standard white T-12 75-w-430MA, 8-foot slimline lamps spaced on 2-ft centers in the 12-ft area above

the corrugated plastic luminous ceiling material. Acoustical fins are placed at intervals below the plastic ceiling which is approximately 16 ft above the floor.

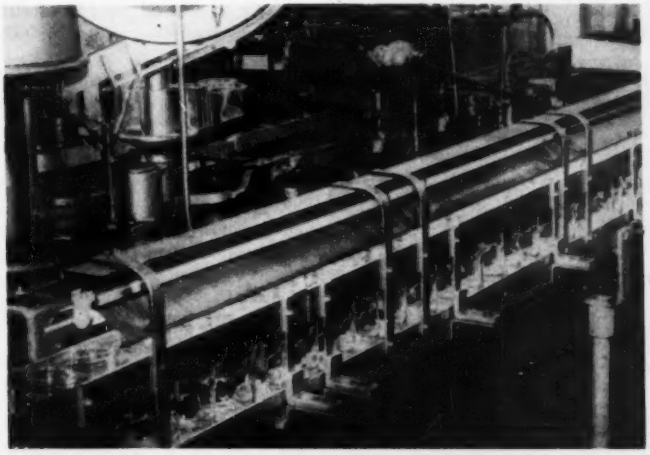
By cleaning off the diffusion paint on the skylight glasses we obtain up to 275 ft-c of well-diffused light at the drafting table level. At night we still receive 65 ft-c of diffused light. The installation has proven very satisfactory. The single lamp light strip was placed on 24 in. centers 24 in. above the plastic ceiling. All elements of this job are carried on a gridwork of lightweight structural steel supports which in turn is suspended by turnbuckles and woven wire rope attached to anchor bolts inserted into the ceiling concrete beams. Watts per sq ft are 4.57. Reflectances of the luminous environment are walls—50% and floor—10%. The co-efficient of utilization is .595.

Warning to H-F Heating Users

All users of induction and dielectric heating equipment manufactured prior to June 15, 1947 must get their equipment certified on or before June 30, 1952. This is in accordance with the provisions of the FCC Rules and Regulations, Part 18, which require certification of compliance with certain minimum radiation requirements.

The NEMA Induction and Dielectric Heating Apparatus Section advise users of older type equipment to contact the manufacturer or a consulting engineer for guidance in complying with the rules.

A complete copy of the FCC Part 18, Rules and Regulations Relating to Industrial, Scientific and Medical Service, may be obtained from the United States Government Printing Office, Washington, D. C.



Bactericidal Lamps Improve Quality

Bacteria control of table syrup is accomplished by bactericidal lamps at the syrup division of the Anheuser Busch Co in New Orleans. Air-borne bacteria are killed in empty jars and cans before the containers are filled with syrup. A continuous line of five 30-w bactericidal lamps is installed in reflectors mounted 3 in. above tops of jars on conveyor belt. Control of bacteria in void between syrup level and top of jar has proven so successful that an additional installation is being made over newly extended conveyor line. J. M. Gensburger, Industrial Engineering & Utilization Dept, New Orleans Public Service, Inc.

INDUSTRIAL BRIEFS

Film Drying with infrared lamps in the photographic laboratory of McGraw-Hill Co, New York, cuts drying time from 1 hr to 10 min. Dryers are made of wood—6-ft high, 6-ft wide and 2-ft deep and will accommodate about 60 4 x 5 in. films. Four 250-w infrared lamps are mounted on the floor, directing the heat upward. A 10-in. fan keeps the air circulating. The former dryers had only the 10-in. fan with no heat. Gerald Moran, asst mgr of the photographic dept, designed and supervised the construction of these dryers.

Better Inspection of defects in steel billets and slabs is provided by 50 ft-c combination 3000-w mercury vapor and 1000-w incandescent lighting units in the scarfing area of Jones & Laughlin Steel, Corp, Pittsburgh, Pa. Improved efficiency steps up steel output. Fewer units are required due to higher efficiency of high wattage units. Incandescent lighting provides color correction and reestablishes lighting instantly on restoration of service after power interruption. Wiring expense is minimized by connecting units on 440 v, 3 phase (with necessary auxiliaries) E. M. Wenner, Industrial Representative Duquesne Light Co., Pittsburgh, Pa.

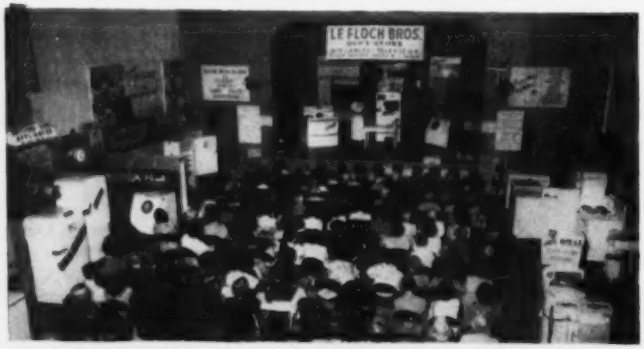
Baking TV Picture Tubes in 160-kw electric oven at cathode ray tube plant of National Union Radio Corp, Hatboro, Pa. provides accurate temperature control and helps maintain uniformity in manufacture. Baking process is put on production line basis as tubes pass thru 104-ft oven. Special dollies equipped with vacuum pumps remove air from tubes during baking. L. Albertson, Application Engineer, Philadelphia Electric Company.

Heating Drafting Room of the Aircraft Division of the Globe Corp, Joliet, Ill., with radiant glass panels saved space and installation time over other types of heaters considered. Working conditions are comfortable and operating expense is expected to be comparable with other heating systems, according to H. L. Linsky, plant engineer at Globe. Thirteen 1000-w heating panels were installed in the 20,000 cu ft room. Continental Radiant Glass Heating Corp.

Dealer-Utility Campaign Sells a Lot of Appliances

VICTOR C. DeMOUTH, Commercial Representative
Orange & Rockland Electric Co, Monroe, N. Y.

EMPHASIS on the "GREAT L-E-N-G-T-H-S" gone to in setting up cooking schools was provided by the 55-ft pole carrying the sign



FOLKS TURN OUT handsomely in attendance at well-publicized cooking schools

EVEN A CHILD—and a boy at that—can make a cake with electric appliances

Cooperation between dealers, distributors and utility sold an estimated total of 930 electric appliances in the service area of the Orange & Rockland Electric Co last fall and early winter. Included are 200 ranges, 240 water heaters, 150 automatic washers, 50 dryers, 30 ironers, 20 dishwashers, 40 home freezers, and 200 refrigerators. O&R has about 13,000 residential customers in the area covered by this promotional activity.

Basis of the campaign was a series of cooking schools, three successive nights in six of the company's seven districts. The schools were set up as follows:

From makes of ranges sold by participating dealers, three were selected by lot, one for each of the three schools in the district.

Home service demonstrators of distributor of selected range conducted range demonstration, assisted by O&R home economist.

Representatives of other makes of ranges sold by participating dealers were given opportunity for selling talks of at least five minutes.

Each participating dealer was allotted space for a display featuring his range and which might also include refrigerator, freezer, water heater, laundry equipment, and dishwasher. Television and radio excluded. Each dealer set up his own display and installed any necessary temporary wiring.

Door prize each night—an electric housewares item—was furnished by O&R.

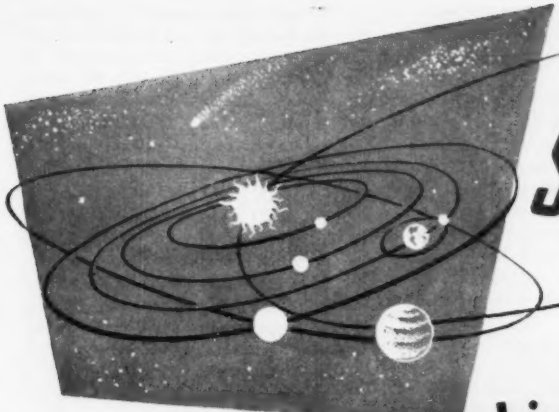
Grand prize—an electric range—was drawn for on third night and was paid for by equal contributions from participating dealers and distributors.

Make of range for grand prize was determined by lot, as drawn by winner.

Winner had to be a residential customer of O&R, and not anyone, or in the immediate family of anyone, connected with any participating dealer or distributor, or the utility.

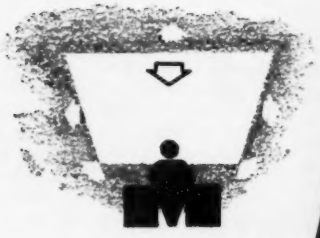
O&R paid for installation of the prize range, up to $70.

O&R provided tickets for registra-

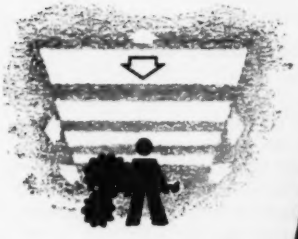


Smithcraft

"a light year ahead in the development of fluorescent fixtures"



for the office . . . for the store



for the factory

America's finest fluorescent fixtures . . . Smithcraft

LIGHTING DIVISION

CHELSEA 50, MASSACHUSETTS

ENGRAVE

PANELS OF ANY DIMENSIONS IN YOUR OWN SHOP WITH THE

Engravo graph

Portable Model I-S

The only portable machine which reproduces 15 sizes from one master alphabet.

The only one with adjustable copy holding slides for multiline engraving in one set-up.

Self-centering holding vise for nameplates.

Send for Booklets
I-S—48 portable model
H—48 heavy duty model

NEW HERMES, Inc.
13-19 University Place, N.Y. 3, N.Y.
In Canada 359 St. James St., Montreal
World's Largest Manufacturer of Portable Engraving Machines

tion and drawings of prizes.

O&R furnished service for demonstrations and displays up to main switch.

O&R paid 1/3 of newspaper advertising cost; 2/3 paid by dealers and distributors.

O&R paid rental of hall for school. Also supplied large banner signs for walls and stage back drop.

Each afternoon before a school session, O&R sent out a sound truck and the long sign shown in an accompanying illustration, to stir up enthusiasm.

Total attendance in the 18 schools in the six districts was 3,600, an average of 200 each night. Dealers reported floor sales of 20 major appliances.

Effectively backing up the cooking schools was the participation of O&R employees. This was organized in an appliance prospect competition. Employees were invited to turn in forms giving names of possible buyers of major appliances. Copies of the forms were then sent to all dealers in the villages or localities of the prospects' residences. Dealer sales resulting from information were reported to the company by return of the form copies and the employees turning in the respective forms were credited with points according to the appliance sold.

Sale of a range, replacing other methods of cooking, gave 500 points to the employee turning in the prospect. But only 200 points were credited for a range sale in a new house. There was a good reason for this large difference. Orange & Rockland is a "straight electric" company. Except for outmoded wood, coal and oil ranges, the strongest present competition against electric cooking is LP gas. Piped natural gas will probably be available in the area soon. Thus the sale of a range replacing gas was considered to be worth the 300 additional points.

The other point credits were water heater, 200; automatic washer, laundry dryer and ironer, 100 each; roaster and dishwasher, 80 each; home freezer and refrigerator, 60 each. Also 20 points were credited for report of a new home under construction. Prizes were five gift certificates of $150, $100, $75, $50 and $25; very appropriate since the competition ended December 14.

Employees turned in 877 prospects. Appliances sold and installed according to prospect forms returned by dealers were 95 ranges, 84 water heaters, 72 automatic washers, 19 dryers, 12 ironers, 9 dishwashers, 21 home freezers, and 146 refrigerators, a total of 461.

News Letters to Home Economists

To aid home service work of public utility home economists, Hotpoint Institute has begun a series of bi-monthly news letters to approximately 2,000 economists explaining new techniques of appliance demonstration. The letters contain appliance information developed in Hotpoint laboratories to meet the demonstration and operation problems of utility home economists and will be used to promote the trend to all-electric kitchens and automatic home laundries.

One appliance is discussed in each letter so new use ideas and ways to demonstrate that appliance can be outlined, according to Helen Kirtland, manager of the institute, who said;

"By supplying appliance information to utility economists in these news letters, we hope to fill the gap in general education that exists on low saturation appliances like the dishwasher, the garbage disposal unit, the automatic clothes dryer, and the food freezer."

Spring Campaigns to Boost Lamp Sales

People are going to buy a lot of lamp bulbs this spring. That is, they will if sales promotion—extensive and intensive—can persuade them. And, undoubtedly, it will. Each of the three major lamp producers has announced large plans for spring sales campaigns. National and local advertising in consumer publications and newspapers; tie-ins on radio and television programs; prize contests; premium offers; elaborate point-of-sale displays; all the ways of inducing buying will be employed.

General Electric has adopted Al Capp's "Li'l Abner" to sing the praises of its lamps. Pieces in the promotional package sent to dealers include four-color window streamers, counter and window cards and price cards all accenting the Dogpatch slogan, "Yo' Kin Plainly See Wif GE". Supple-

Load going up?

Watch equipment temperatures— with L&N instruments

When overloads make temperatures climb, one of the surest ways to guard against damage is to check equipment hot spots with L&N instruments. A complete family of detecting elements and instruments is supplied for temperatures of generator fields and stators, motors, bearings, transformers, air and hydrogen coolers, cables and other major electrical equipment.

Temperature detectors. For bearings, a fast-responding L&N thermocouple inside 3/16" tubing can be mounted to detect temperature either in bearing metal or oil. For most other applications there is a selection of four types of Thermohms — copper resistance thermometer elements — which can be assembled into winding slots, mounted in ducts or put into wells for use in either water or oil.

Instruments. Available in standard ranges for use with thermocouples or Thermohm detectors are multiple-point and single-point Micromax and Speedomax Recorders of the type which have rendered years of dependable service in hundreds of power plants. Newest model is a Speedomax which indicates and records as many as 160 thermocouple temperatures at a rate of one every four seconds. All these automatic instruments can operate signals and alarms.

For literature and engineering service specific to your application, write our nearest office or 4938 Stenton Avenue, Philadelphia 44, Pennsylvania.

LEEDS NORTHRUP

Jrl. Ad. ND4-33-461(2)

Line foreman has trouble, calls for materials fast.

"RCA 2-WAY RADIO

cuts our outage time 90%"

says Mr. Milton Sturdivant,
Superintendent of Construction and Maintenance,
Brazos River Transmission Electric Co-operative, Texas

"WITH RADIO, our crew is on the job as fast as it formerly took us to reach a phone. *Radio is indispensable* . . . we just couldn't function without it."

RCA Radio covers big Texas utility

The Brazos River System stretches out over 100,000 square miles of Texas . . . includes steam plants, hydro plants, and 1000 miles of 69 KV lines. RCA 2-way radio operates from seven base stations in power plants, linemen's homes, and 28 mobile stations in cars, pick-ups, and trucks. Maintains instant voice contact between supervisors, foremen, load dispatchers, line crews, line patrolmen. Three years on the job, 2-way radio is giving the vital communications that keeps the system running smoothly.

Could your operation use radio?

Everywhere it's applied, *RCA 2-way radio works wonders*. Saves time, manpower, money. Ends aimless driving. Saves wear and tear. Speeds repairs in emergencies. Pays for itself many times over through better, more efficient operation.

Radio easy to install—operate—maintain

Mobile units are compact, rugged . . . can be installed in truck or car quickly and efficiently. Easily maintained, use standard tubes. Central transmitter serves any number of mobile units. Designed and backed by RCA . . . world leader in radio.

Get full story on RCA 2-way radio now. See how it can help out on your operation. Mail coupon . . . TODAY.

Near-by line truck is ordered to rush materials to trouble spot.

Meanwhile field superintendent also drives to trouble spot.

Dept. 45CC, RCA Engineering Products Department, Camden, N. J.

Please send my FREE copy of illustrated booklet on how RCA 2-way radio can save time, manpower, and money for me.

Name_____

Title_____

Company_____

Address_____ City_____ State_____

RCA **RADIO CORPORATION of AMERICA**

mental material tells the dealer how best to use the displays and provides helpful sales tips.

Westinghouse is repeating the prize contest idea that proved its effectiveness in previous years. More than 500 people who convincingly argue the case of the well lighted home will share prizes worth $25,000, including a top award of $5,000 in cash. They will complete in 25 words or less the sentence, "A brightly lighted house is a happier place to live because . . . . . ." To enlist their full cooperation, dealers will compete in a special display contest for prizes amounting to $5,000, with $1,000 in cash at the top.

Sylvania's gimmick is a premium, a "Magic Window Cleaner," tying in with the traditional spring housecleaning. This is offered to consumers for 25¢ and the end of a 4-pack lamp carton. It consists of a sponge and squeegee assembly with reversible handles to allow the two uses.

Germanium Rectifier

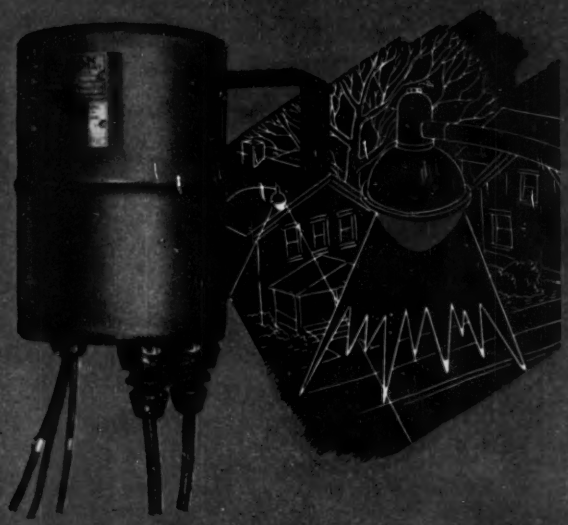
The General Electric Co has announced development of a new power rectifier for television receivers, radios, and military electronic equipment. It is believed to be the most efficient commercial rectifier ever produced and employs germanium, a metal not critical in the mobilization effort. Known as the G-10 germanium rectifier, the unit operates on the junction principle and is designed to supply 350 milliamperes at normal television receiver plate voltages in a 55 degree centigrade ambient. It has a peak inverse voltage rating of 400 volts, with rectification efficiencies up to 90 per cent.

Warehouse for Sylvania

Sylvania Electric Products Inc, has leased an 81,000-sq ft building in Zanesville, Ohio, for use as a central distribution warehouse for fluorescent lighting fixtures. The Zanesville facility will be the fourth major warehouse Sylvania has put into operation within the past few months. The company recently opened a large incandescent lamp warehouse at Salem, Mass, and sales warehouses for general products at Dallas, Tex, and Detroit, Mich. Now nearing completion in Seattle, Wash, is a 20,000-sq ft building that Sylvania has contracted to lease as a sales warehouse.

TRANSFORMER OPERATOR'S QUIZ:

How do KUHLMAN street lighting transformers virtually eliminate maintenance costs?

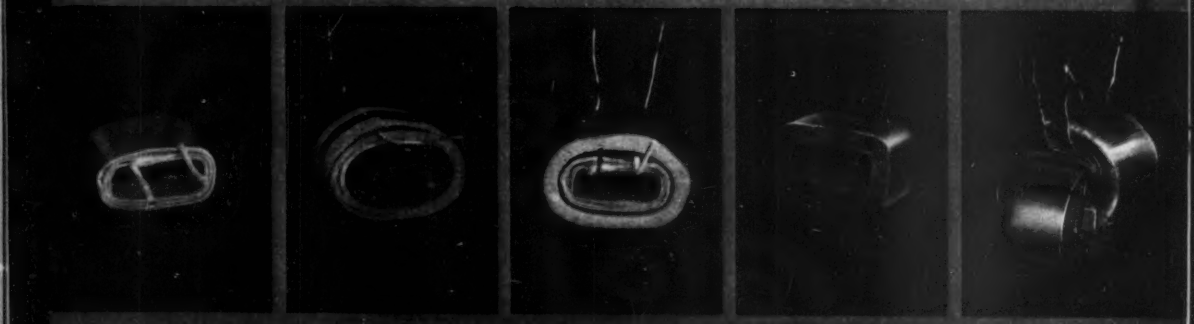


Kuhlman Street Lighting Transformers require practically no maintenance because they are compound-filled and equipped with a drawn copper bearing corrosion resistant steel case. You can install them and forget them.

Important, too, is the fact that the Kuhlman Street Lighting Transformer line provides a unit for every need—vault, manhole, lamp base or aerial mounting. These transformers have a guaranteed current regulation of 1% with lamps having a wattage variation of from 20% below normal to 10% above normal. Thus, they insure longer life for your lamps.

Kuhlman comes by its street lighting transformer know-how naturally. Many years ago, Kuhlman engineers developed the forerunner of the present day street lighting unit. This development takes its place beside other famous Kuhlman "firsts" such as the Bent Iron Core, "Quick-Grip" bushing, and silicone insulation.

The Famous Bent Iron Core



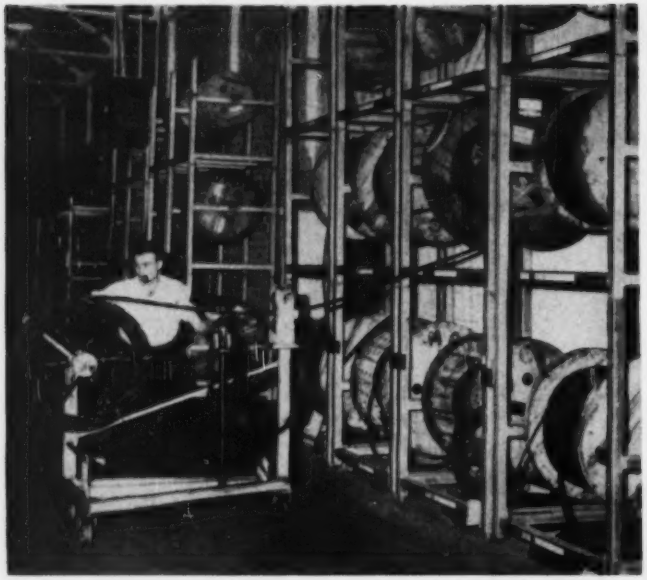
The Kuhlman Street Lighting Transformer core and coil in various stages of construction. At right is the Kuhlman pioneering Bent Iron Core, which utilizes oriented steel and lapped joint construction, providing great savings in weight and exciting current reduction.

Kuhlman ELECTRIC COMPANY, BAY CITY, MICHIGAN

A great name in transformers. Write for descriptive bulletins on Kuhlman power, distribution, dry type, Sol-T-Kuhl and specialty units.

EXPORT REPRESENTATIVES: *International Standard Electric Corporation,* 67 Broad Street, New York 4, N. Y., Cable Address, Microphone, N. Y.

NEW EQUIPMENT



Cable Reel Rack

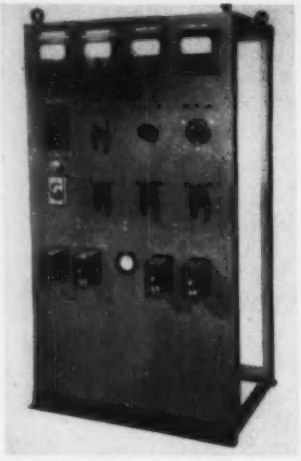
A new reel rack has been designed and developed to conserve space and facilitate the handling of reels of cables, loom, wire, rope, extruded plastic shapes, etc.

The reel is placed in the rack at floor level. "U"s provided on the cross members locate the reel axle. Reel and rack is then handled as a unit by a lift truck.

The new type cable racks are of welded square-tube construction with self-aligning nesting feet that make stacking sure and easy. With each reel free to rotate independently, lengths of cable can be dispensed readily as needed by the construction department.

This cable rack should find particular adaptability to electric utility storerooms, where time and space are valuable.

Equipment Manufacturing Inc, 21550 Hoover Road, Detroit 5, Mich.



DC High-Pot Tester

A combination dc high-potential test set and a cable-fault locator has been developed recently.

The cable-fault set uses the direct method of locating insulation faults on power cables employing a dc tracing current.

As a high-potential test set it features continuously adjustable output by means of a thyratron grid control, a dc output voltmeter to indicate actual crest voltage applied to insulation, three scale ammeter for indicating leakage current, and can be operated continuously at both rated voltage and current.

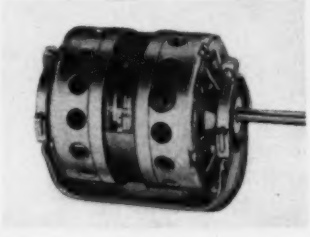
For fault locating, features are higher output voltage, built-in ac line reactor to hold constant fault-reduction current regardless of the resistance of the fault, and high capacity and high voltage which are advantageous in burning unstable faults.

Peschel Electronics, Inc, 13 Garden St, New Rochelle, N. Y.

Guy Strand Clamp

A little spring clamp designed to hold the loose end of the guy strand firmly to the guy has been developed. The ServiSleev eliminates the time consuming method of wrapping the loose end of the guy wire with tape or separate strands. Made of galvanized steel with a belled end, installation time is reportedly only four or five seconds.

Hubbard and Co, 6305 Butler St, Pittsburgh 1, Pa.



Induction Motor

The Model 3700, rated 1/25 to ¼ hp, is claimed to be a completely new induction motor featuring a new resilient mounting base, lightweight and quiet operation.

Presently available, are the hysteresis synchronous and normal induction types in 2 pole versions, both single phase and polyphase.

Howard Industries, Inc, Racine, Wisc.

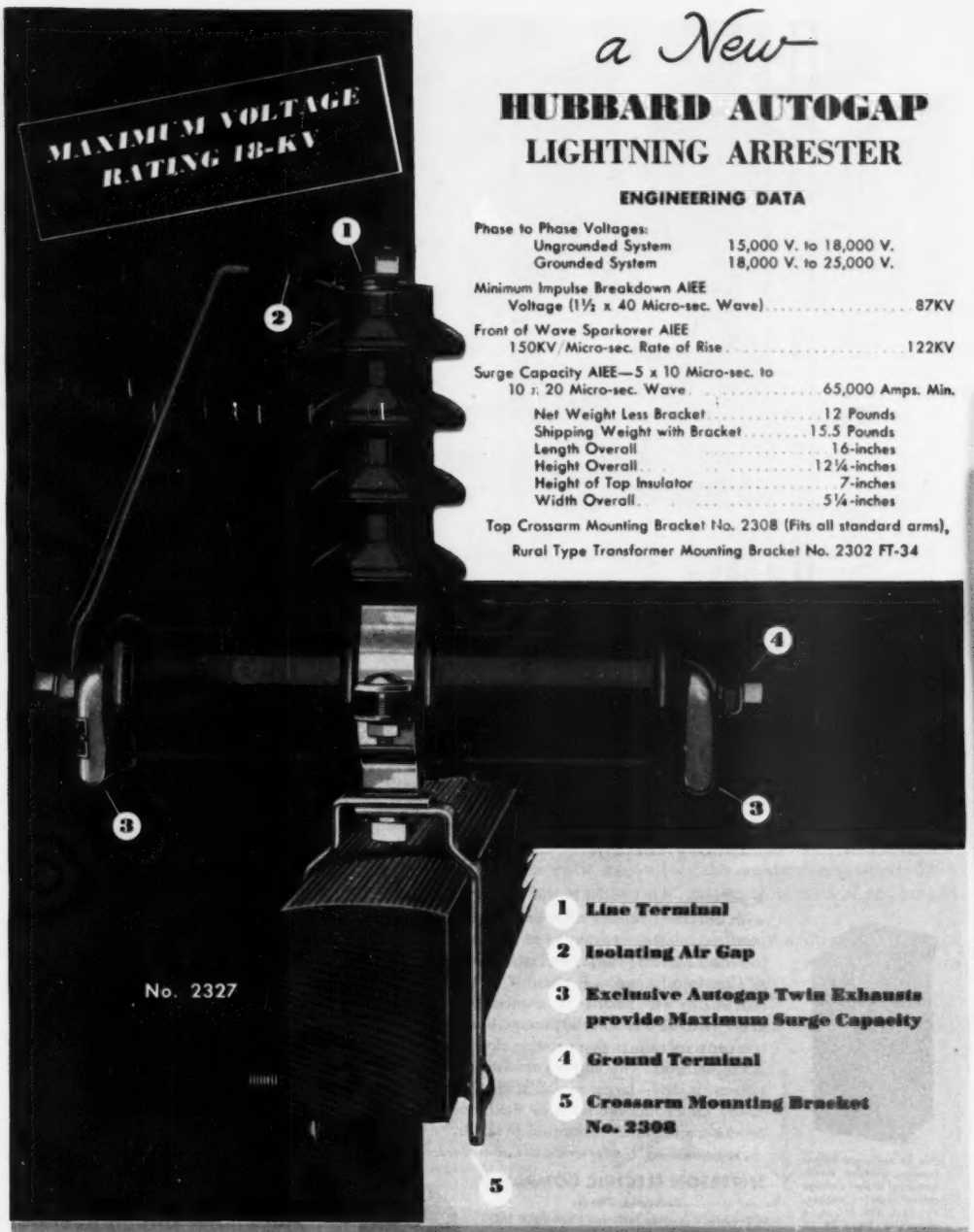
a New

HUBBARD AUTOGAP LIGHTNING ARRESTER

ENGINEERING DATA

Phase to Phase Voltages:	
Ungrounded System	15,000 V. to 18,000 V.
Grounded System	18,000 V. to 25,000 V.
Minimum Impulse Breakdown AIEE Voltage (1½ x 40 Micro-sec. Wave)	87KV
Front of Wave Sparkover AIEE 150KV/Micro-sec. Rate of Rise	122KV
Surge Capacity AIEE—5 x 10 Micro-sec. to 10 x 20 Micro-sec. Wave	65,000 Amps. Min.
Net Weight Less Bracket	12 Pounds
Shipping Weight with Bracket	15.5 Pounds
Length Overall	16-inches
Height Overall	12¼-inches
Height of Top Insulator	7-inches
Width Overall	5¼-inches

Top Crossarm Mounting Bracket No. 2308 (Fits all standard arms), Rural Type Transformer Mounting Bracket No. 2302 FT-34



1 **Line Terminal**

2 **Isolating Air Gap**

3 **Exclusive Autogap Twin Exhausts provide Maximum Surge Capacity**

4 **Ground Terminal**

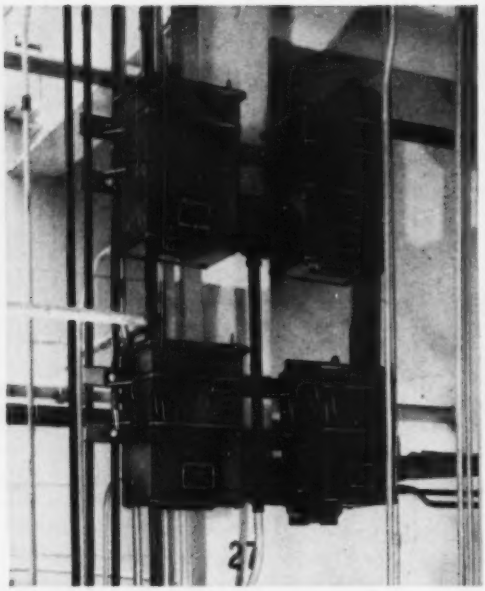
5 **Crossarm Mounting Bracket No. 2308**

HUBBARD AND COMPANY

ESTABLISHED 1845

PITTSBURGH • CHICAGO • OAKLAND, CALIFORNIA

"Hang the load on Hubbard Hardware!"



One Jefferson Serves Variety of Voltage Requirements

★ **Connect to 460- or 230-volt line**

★ **Provide 230- or 115-volt secondary current**

Use of Jefferson Transformers permits distribution of higher voltage current — saves copper, conduit, etc. Made in capacities from 50 to 15000 watts.

• Jefferson Air Cooled Power Circuit Transformers, with universal voltage ratio design, reduce the stock required to meet a variety of requirements. Leads are provided for two primary and two secondary voltages.

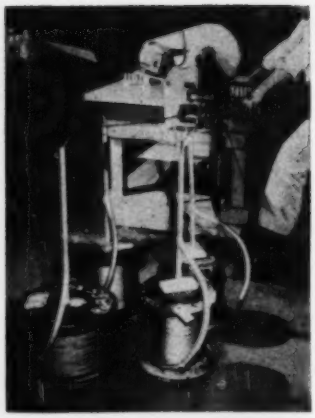
This feature makes it possible to meet varied requirements with smaller investment. Longer maintenance-free life is another advantage, based on conservative capacity ratings that provide more than adequate safety margins. The ample construction design also reflects quality—large, roomy wiring compartments, handy knockouts for rigid or flexible conduit connections, and sturdy mounting brackets.

Approved by Underwriters' Laboratories, Inc.

JEFFERSON ELECTRIC COMPANY
Bellwood, Illinois
In Canada: Canadian Jefferson Electric Co., Ltd., 384 Pape Ave., Toronto, Ont.

JEFFERSON ELECTRIC

POWER CIRCUIT TRANSFORMERS
DRY TYPE



Cable Feeding Assembly

A cable feeding assembly made of two pieces of welded tube has eliminated the need for large wooden racks previously used to hold cable spools.

Device consists of a straight piece of tubing with one end flared, to which is welded just below the flared end a second piece of tubing bent in the form of a modified semi-spiral. It not only eliminates need for spool racks, but also the time and energy required to load heavy spools onto the racks. **Texas Eng and Mfg Co, Box 6191, Dallas, Texas**

Automatic Circuit Recloser

A complete, new re-design of the R&IE single-phase, automatic circuit recloser for 7.2-kv nominal service reportedly has improved operating and service features.

Unit offers protection against temporary or permanent faults with four

opening and three reclosing operations to lockout. The type MB-1 is claimed to be the only full power class recloser engineered for continuous duty current—100, 140, 200 and 280 amp. Full coordination with line fuses can easily be set up.

High interrupting capacity, as high as 6000 amp, is available. Mounting can be on crossarm, direct-to-pole or on a structure. Insulated steel tank and internally mounted coil protector are safety features.

R&IE Equipment Div, Greensburg, Pa.

Compression Type Connector

A one-piece compression type tap connector, the 8-Splice has been developed.

It is suitable for use where taps are made to continuous main wires and also at end-to-end connections. Tin plated, it is reported to be suitable for aluminum or copper wires or for joining both. The 8-Splice is available in three sizes for No 6 Str to No 2 Str copper or aluminum, 3-No 10 to 3-No 8 Copperweld, and No 6 and No 4 ACSR conductor.

A new compression tool, the Splice-jig installs all of the 8-Splices.

Compression Splice Co, Inc, 53 South Broadway, Yonkers, N. Y.

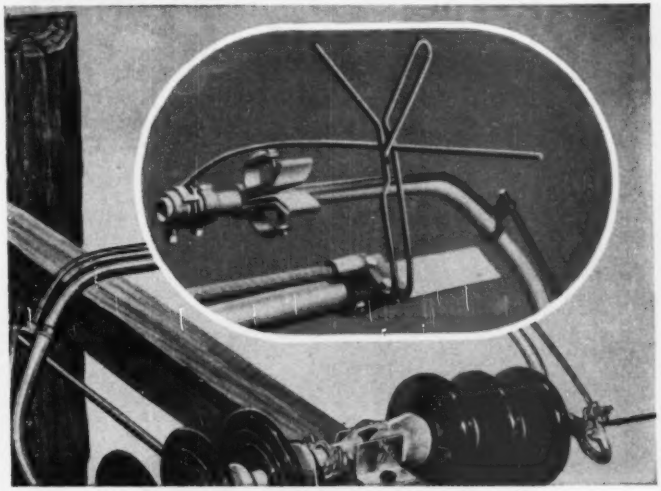
Hermetically Sealed Limit Switch

A distinctly new-type limit switch that is completely hermetically sealed has been announced by Electro-Snap.

It is claimed to be best suited for applications where ordinary splash proof or enclosed switches are not adequate because of humid or corrosive atmosphere.

Hermetic sealing with inert atmosphere is used. A feature is a tipping diaphragm action, with no sliding parts,

KPF POLE TOP SWITCHES



Drop 40 miles of 69 kv lines with KPF Quick-Break pole top switch

Operating engineers tell us KPF switches with Quick-Break attachment are the most outstanding air-break switch improvement in 25 years. Before development of this Quick-Break device, pole top switching of 69 kv circuits was limited to some 6 miles of line. Now, operating experience shows that 40 miles of 69 kv line can safely be dropped with this equipment.

The secret of the KPF Quick-Break is a heavy-duty cat's whisker which whips free in a split second as the switch is opened. This mechanism prevents establishment of an arc; thus critical arc length is no problem.

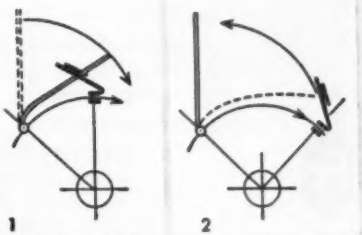
The KPF Quick-Break attachment is simply and ruggedly constructed for low cost, long life and all-weather dependability. It is available for all KPF switches rated 15 to 69 kv.

HERE'S HOW KPF QUICK-BREAK WORKS

1. Spring rod winds to full tension as switch opens.

2. Rod springs clear, breaking contact at high speed.

Write for details of KPF Quick-Break attachment and low cost, long-lasting, easy-to-install KPF Switches.



KPF ELECTRIC COMPANY
1624 E. Alpine Avenue • Stockton, California

for true economy in street light control

THE FISHER-PIERCE PHOTOELECTRIC CONTROL

- LOW INITIAL COST
- LOW INSTALLATION COST
- LOW MAINTENANCE COST

The cost of control of street lighting includes more than just the price of the control itself. Cost of installation is another major factor. Maintenance costs, if too great, can overcome all other economies.

The F-P Series 63300B Control combines *all three* elements of economy. No control of similar specifications has as low a purchase price. None requires fewer man hours for installation. No other control has equalled the F-P record for maintenance economy.

Fisher-Pierce is able to provide this economy in street lighting control because of its years of experience and its extensive engineering organization. Fisher-Pierce Controls have been proven by the experience of over 700 utilities now using more than 35,000 Fisher-Pierce units.

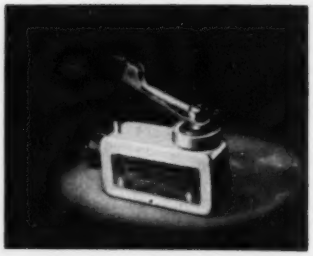
If you are considering adding to or modernizing your street lighting, be sure to investigate the possibilities of Fisher-Pierce photoelectric controls.

Write for Bulletin 63300B.

The FISHER-PIERCE CO., Inc.
82 Pearl St., So. Braintree, Boston 85, Mass.

EXPORT: PHILIPS EXPORT CORP. 100 E. 42nd STREET NEW YORK 17, N.Y.

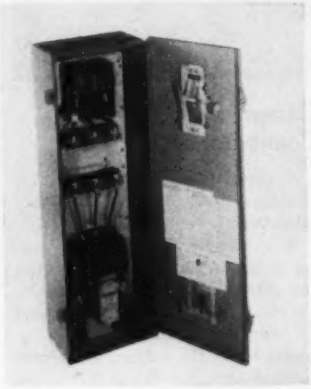
IN CANADA: NORTHERN ELECTRIC CO., Ltd.



to prevent jamming from ice formations.

Switch weighs only 0.38 lb with overall dimensions 2-9/16 x 1-9/16 x 1-3/16 inches. Internal switching mechanism is said to endure in excess of 10,000,000 mechanical cycles of operations.

The Exhibit Supply Co, 4218 West Lake St, Chicago, Ill.



Across-the-Line Starter

A combination across-the-line motor starter with fusible disconnect switch is now available in NEMA sizes 0 through Z.

Starter consists of a disconnect switch, main-line fuse clips, and a Life-Line starter in a common enclosure. Starters are available for 3-phase operation, up to 600 volts, 60 cycles.

Westinghouse Electric Corp, Box 2099, Pittsburgh 30, Pa.

High Temperature Insulation

A new high temperature, high frequency and high voltage plastic insulation has been added to the company's line of products.

The translucent film is stated to

withstand temperatures from -100 to 500F and meets both Class B and Class H requirements. Non-flammable, it will not track. It is also unaffected by all types of impregnating varnishes, and will not absorb moisture.

Minnesota Mining and Mfg Co, 900 Fauquier St, St Paul 6, Minn.

Germanium Rectifiers

This new line of industrial rectifiers can reportedly operate at current densities up to 1000 times greater than copper oxide or selenium stacks. Made of germanium, rectifiers are designed for power conversion in intricate computing machines, radar devices and other applications where size and weight are important considerations.

Models being produced include single phase, half wave ratings of 12v/0.4a; 21v/0.4a; 27v/0.4a and 6v/6a.

General Electric Co, Schenectady 5, N. Y.

Megger Low Resistance Ohmmeter

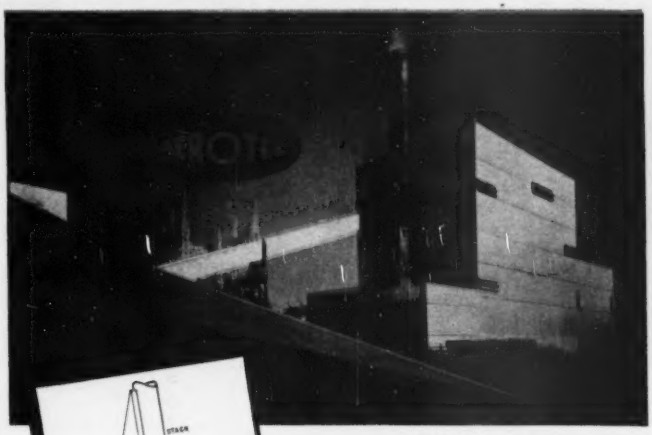
Designed for maximum convenience in field use, this set is completely self-contained with a compartment for storing leads and hand spikes.

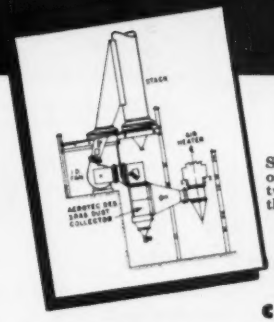
Available in two models, both having the same ranges of 0 to 1000 and 0 to 10,000 microhms. Model 1 B is a battery powered set which uses 2 dry cells or equivalent. Model 1 R has a built in rectifier which can be

another power plant application of the

AEROTEC DUST COLLECTOR

promoting better community relations





Riverton Station
Northern Virginia Power Company

Sectional drawing shows location of AEROTEC Dust Collector between air heater and I.D. fan at this Riverton Station.

Promote your

community relations

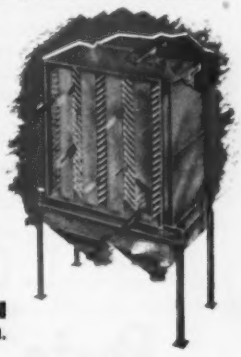
the highly efficient Aerotec way

A clean stack has proven time and again to pay valuable dividends in community good will. To gain this advantage, plus plant erection and maintenance economies, public utilities are specifying the Aerotec Design 3 RAS Dust Collector. This unit develops a higher centrifugal force through the use of multiple, small-diameter tubes, resulting in exceptionally high efficiencies on ultra-fine dusts.

Flexible and space-saving

The tubes are permanent mold aluminum and closely nested to provide lighter weight and more capacity per square foot of plan area than any collector of comparable efficiency. They are set at a 45° angle on vertical tube sheets, factory-assembled into lightweight "building block" sections that reduce installation time and permit the Aerotec Design 3 RAS to be easily tailored to fit available space.

Our field engineers specialize in solving flyash collection problems and welcome the opportunity to assist you at any time. Call or write. No obligation.



Project Engineers

THE THERMIX CORPORATION

GREENWICH, CONN.

(Offices in 38 Principal Cities)

Canadian Affiliates: T. C. CHOWN, LTD.

Montreal 25, Quebec — Toronto 3, Ontario

THE AEROTEC CORPORATION

GREENWICH, CONN.

"Cousin Tim's ground line was a disgrace!"

(Cissie Cleanpole's stories of the grim days B.P.)*

"Cousin Tim should be a lesson to us all! Straight and tall and handsome he was, with the jauntiest crossarms on the line. But my dear, his ground line!

"No one noticed for a long time how he was rotting away down there. But it grew worse and worse, until even his friends were talking. Before the end, he had wasted away at the ground line until he was no bigger than a fence post! My mother used to cry when she told of him. It was before the days of PENTA, of course . . ."

*B.P.—*Before PENTA*

PENTA gives clean, positive protection

Cousin Tim's ground line—and his whole length, above and below the ground—would have remained staunch and true if he had been treated with PENTA Preservative.

PENTAchlorophenol, the *clean* chemical formula so easy on the men who climb the poles, guards danger areas like a hawk. And PENTA is not only constant and uniform in its properties—it's powerful!

Poles treated with deep-penetrating PENTA are protected scientifically from the hazards of shell rot, top rot, ground line decay and insect damage. Yet PENTA's *clean* protection for your poles costs no more than other types of wood preservation. For names of companies supplying PENTA-protected poles and crossarms, write:

CHAPMAN CHEMICAL COMPANY
333 N. Michigan Ave., Chicago 1, Ill.
Dermon Building, Memphis 3, Tenn.

CHAPMAN

Penta Preservative

Conforming to A.W.P.A. Specifications P8-49 and P9-49

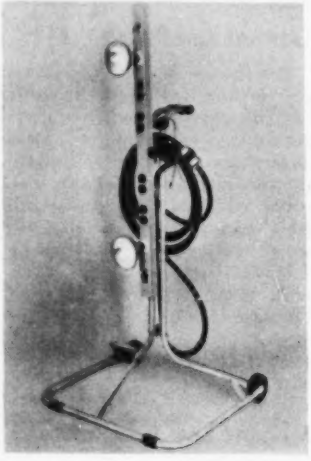
connected to any convenience outlet.

Complete unit weighs only 19 pounds including batteries or rectifiers, and is easily transported.

Ranges of the instrument cover a wide variety of applications such as routine tests on circuit-breaker contacts, relay switches, connections and joints, and bar-to-bar tests on armatures.

No special training is needed in order to operate this instrument.

James G. Biddle Co, 1316 Arch St, Philadelphia 7, Pa.

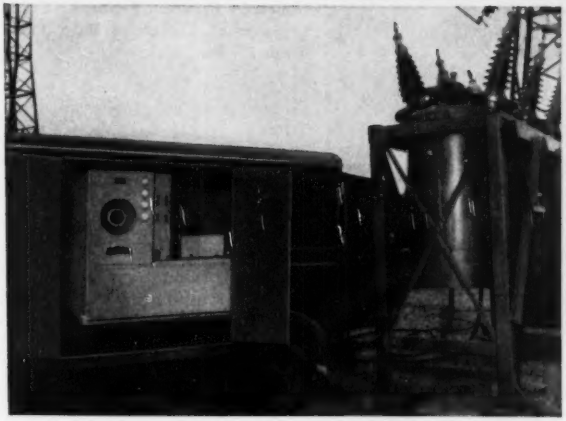


Portable Branch Circuit Extensions

A new series of devices known as Rolla-Duct, provides a power and light head, a lighting head with four sockets, or a four-socket infrared spreader.

The carriage-mounted units carry an approved rating for 20-amp loads for 115 or 120 volt operation and

BOWSER has the RIGHT answers for these 2 OIL CONDITIONING PROBLEMS



Portable Bowser Hydro-Vollfier conditioning unit for transformers, circuit breakers and switches.

...the best PERFORMANCE INSURANCE money can buy!

INSULATING OIL

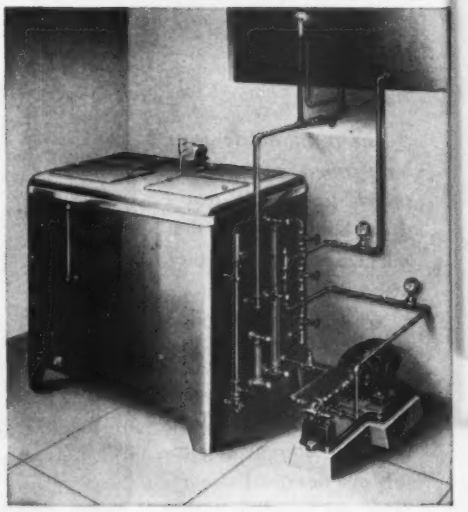
In a SINGLE PASS the Bowser Hydro-Vollfier restores oil dielectric to 35 k.v.!
Volatile corrosive acids, gases, dissolved moisture and solids . . . the enemies which promote sludge formation in insulating oil . . . are effectively removed. The process is fully automatic.
NO SERVICE INTERRUPTIONS . . . because this exclusive Bowser process reconditions insulating oils while energized! And less standby equipment is needed.

TURBINE OIL

"Bone dry," crystal-clear oil from a Bowser conditioner is the best stay-on-the-job insurance a turbine bearing can have. Costly bearing failures . . . caused by these 8 destroyers of turbine oil . . . are avoided:

- Turbulence
- Air Entrainment
- Moisture Contact
- Heat
- Metallic Contact
- Inhibitor Removal
- Fly-ash
- Dust

In some plants, turbines served by Bowser units have not had the oil changed for many years.



Bowser oil conditioner serving turbine.

Operating costs are much lower with these Bowser units. May we send you complete data?

BOWSER, INC., 1384 CREIGHTON AVENUE, FORT WAYNE 2, INDIANA

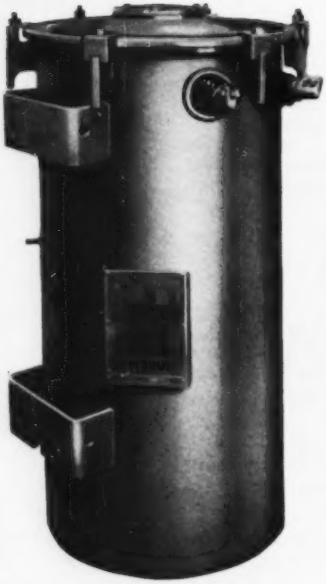
Regional Offices • Atlanta • Chicago • Cleveland • Dallas • Kansas City
New York • San Francisco • Washington, D. C. • Hamilton, Ontario

Lamp manufacturers have spent years in research to provide good street lighting lamps that will give hundreds of hours of brilliant illumination.

Why spoil these good lamps with high inrush currents.

Hevi Duty Static Type Constant Current Regulators are designed to eliminate the conditions that shorten the useful life of a good lamp.

Write for bulletin CCR478



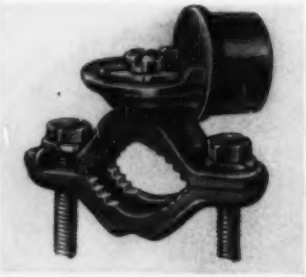
HEVI DUTY ELECTRIC COMPANY

HEAT TREATING FURNACES HEVI-DUTY ELECTRIC EXCLUSIVELY

DRY TYPE TRANSFORMERS — CONSTANT CURRENT REGULATORS

MILWAUKEE 1, WISCONSIN

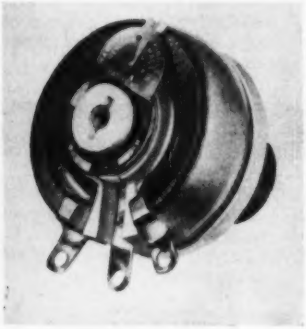
are designed as portable branch circuit extensions. Units are suited for industrial maintenance work, construction jobs, and underground construction. Portable, units can be carried on utility service trucks.
National Electric Products Corp, Chamber of Commerce Bldg, Pittsburgh 19, Pa.



Ground Rod Clamp

A new rigid-type solderless fitting for bonding ½-in. conduit to water pipe or driven ground has been announced.

Fitting is an extra heavy, high strength clamp made of special bronze alloy of high electrical conductivity. Fitting takes up to No 4 AWG, ½-in. conduit and fits ¼ to 1-in. water pipe or ground rods.
H. B. Sherman Mfg Co, Battle Creek, Mich.



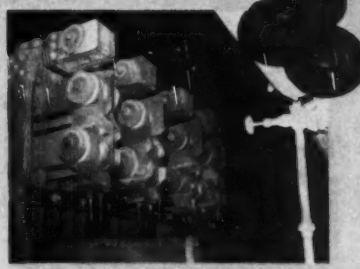
50 Watt Rheostat

The design of the contact arm of this new rheostat permits the use of a brush which affords a minimum of resistance between the resistive element and collector ring.

Features are high terminal strength, shock resistance, and greater safety.
Hardwick, Hindle, Inc, Newark 5, N. J.

Dow Corning Silicones

hold electrical failures DOWN.. production UP



These cotton-phenolic spacer disks and tubes were used to insulate the knife-switches on a 45,000 ampere graphitizing transformer. Operating temperature ranging from 400 to 500°F., converted the organic insulators to charred, cracked, shrunken conductors in less than 30 days. Constant shrinkage required daily tightening of switches. Replacement meant loss of an entire day's production.

These silicone-glass spacer disks and tubes were installed 11 months ago. Switches have never required tightening and the silicone-glass laminates are in excellent condition. Plant engineers expect these parts to last several years. They have already repaid their original cost many times in increased production, reduced maintenance and down time.

Performance of the silicone-glass laminates described above is typical of all electrical insulating materials made with Dow Corning silicones. In fact, the tougher your operating problem the faster these remarkable materials pay for themselves. That's true of all silicone products including electrical insulating varnishes; oils and greases for special high and low temperature lubrication; protective coatings; water repellents; or, Silastic* seals and gaskets that remain flexible and resilient over a temperature span of 600° from −100 to over 500°F. They cut maintenance costs; step-up production.

Call our nearest branch office for technical assistance or write to Dept. AY-15

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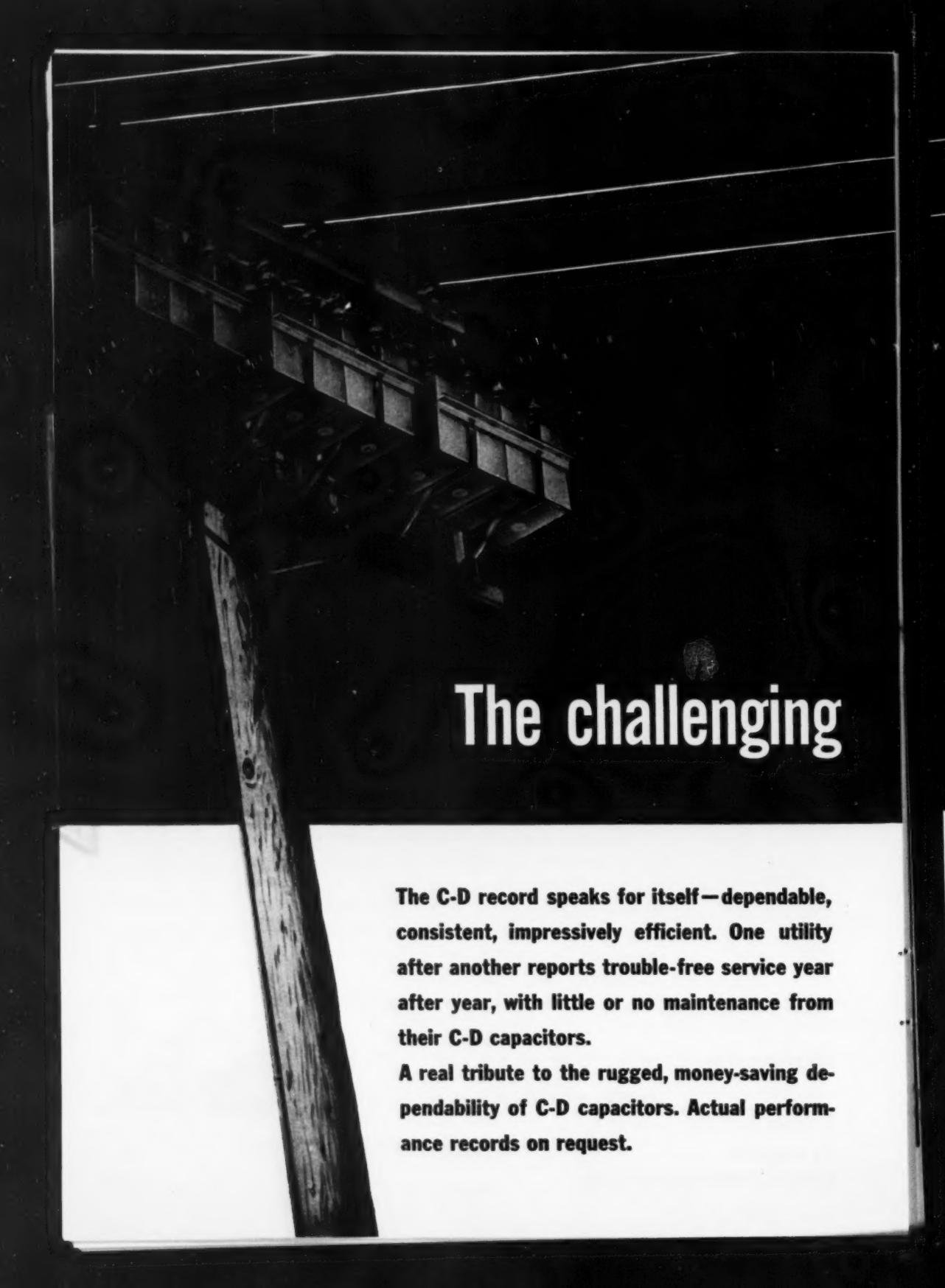

The challenging

The C-D record speaks for itself—dependable, consistent, impressively efficient. One utility after another reports trouble-free service year after year, with little or no maintenance from their C-D capacitors.

A real tribute to the rugged, money-saving dependability of C-D capacitors. Actual performance records on request.

performance of C-D capacitors

These exclusive C-D features mean more value for your capacitor dollar:

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- Solderless service connector
- Heavy-duty wet process porcelain bushings for longer creepage path, less breakage, higher impulse rating
- Wide margin between paper and foil provides higher impulse level
- Capacitor impregnated and case filled with non-inflammable, non-explosive Dykanol
- Use of C-D's Dykanol results in lower unit weight per Kvar; high stability; long life
- Many small sections in series-parallel results in low voltage gradient; no corona; lowest dielectric unit stress
- Only C-D capacitors (from 230 to 13,800 volts), are tested at full rated voltage for a period sufficient to establish ultimate heat rise

If you are considering an installation of industrial, station or pole-type capacitors for power-factor improvement, you can save maintenance dollars by talking it over with a C-D engineer. Cornell-Dubilier Electric Corp., Dept. D-32 A, South Plainfield, N. J.

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Buckingham Adjustable Climbers

Now—one pair of climbers that fits tall men, short men—all men on the crew! One pair of climbers that accommodates the various thicknesses of footgear and clothing worn in different seasons!

New Buckingham Adjustable Climbers are quickly and easily adjusted from size 15" to size 18" by means of an oval head set screw and lock washer, assuring exact fit. If desired, leg irons can still be bent to follow the shape of the wearer's leg.

These advanced-design climbers permit utilities to carry a smaller stock of climbers. They are eminently practical as extra climbers. And—because they will fit any worker—they're ideal for sub-station, plant or service truck.

Famous Buckingham Quality, Safety, Comfort

Buckingham Adjustable Climbers can readily be fitted with leg and foot straps, and deluxe leather pads filled with rubberized wool for greater comfort. Gaffs are permanently attached to the leg irons, pitched at an angle which permits closer standing to the work—less chance of cut-out—easier climbing.

Standardize on Buckingham Adjustables. Fewer pairs are needed to keep every man working.

Ask about them at your supply house — or write for further information.

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WHAT THEY'RE SAYING

At Industry Meetings

Future of the Power Industry

Allen S. King, *executive vice president, Northern States Power Company before the annual employees meeting.*

We may expect many revolutionary changes in the art of generation and distribution of electricity in the future years. These changes will occur only if the power industry is permitted to continue as a free enterprise in the American pattern which encourages initiative and is not thwarted by government encroachment.

Nationalization of the power industry can take place in two ways:

1. By direct action of the government
2. By a piecemeal process of taxless subsidized competition.

The latter process is the real danger. Our people will not choose socialism, but they could have it forced upon them by slow degrees through the insidious processes of the taxing power.

We can fight this by openly attributing our success to the processes of free enterprise. Also, we can conduct the daily operation of our business in such a way that our customers would rather do business with us than with anyone else, including our government.

Research and Industry

David Sarnoff, *chairman of the board, Radio Corp of America before the Board of Directors of Stanford Research Institute.*

Present day taxes have pretty well eliminated the private philanthropist. Wealthy patrons who sponsored men of science are fading from the picture.

Some people say the government should step in and foot the bill. Certainly if industry doesn't the government will have to do it. However, there are three good reasons why we shouldn't allow this to happen.

First, any time the businessmen of the country fail to meet a revealed public need and abdicate their responsibility to government, they are fostering the thing they want least. That is, increased governmental control of their operations and of the daily lives of all the people.

Secondly, I believe government control of research would destroy the

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PNR 12-conductor #9 AWG 1¼" conduit

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- **YOU SAVE STEEL**

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- Lighter and smaller. Easier to handle, store, ship, pull through conduit.
- Flexible to —25°C (—13°F). No cracking!
- Rated 600 volts . . . conductor operating temperature 75°C (168°F).

*Average determined by comparison with competitive control cable.

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Koppers Pressure-Creosoted Poles are famous for giving decades of dependable service—the kind of service that makes your line operation easier . . . holds maintenance expense to a minimum . . . cuts replacement costs appreciably.

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very qualities that enable researchers to make such an important contribution to society. For government control means rigid lines would be set for research and these lines may not meet changing requirements. Industry is best qualified to define its own research needs. The partnership of research and industry loses its meaning when government can dictate the subject and objective of research in any competitive system of private enterprise.

The third reason is that the only money the government has is the money it gets directly or indirectly from industry and the people industry serves. Therefore, if the government supports industrial research, business will still be paying for it. Business, in their own self-interest as well as in the public interest, should bear their fair share of the financial load.

Multiple Purpose River Projects

M. L. Cooke, *consulting engineer in management, before American Assoc for Advancement of Science, Philadelphia, Pa.*

Anything like expert planning for water is not just around the corner. Without essential remedial steps, not associated with engineering, grave shortages of water and increasing floods are inevitable.

A woeful lack of standardization exists in the field. Peace time construction work under a military system, as the Army Engineers, is impossible. Ten dams built for irrigation by Reclamation in the Dry West are standing idle as "mute monuments to a variety of furtive subsidies."

New Device for Power Plants

Stanley A. Kroll, *vice president and chief electrical engineer, Taller and Cooper, Inc, before the New York section of the Instrument Society of America.*

As many as 400 different conditions in an electric power plant can be automatically reported, recorded and printed by a new device with a phenomenal memory.

The new automatic data recorder will show normal operations as well as any deviation from the normal in transformers, boilers, turbines, circuit breakers and other auxiliary equipment. It can store up as many as 26 different reports on occurrences which can happen as close as 10/1,000 of a second apart. Then, this information will be fed to the recorder and printer.

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R. D. BLASIER

J. E. PAYNE

Blasier, Payne Are Elected . . .

. . . vice presidents of Westinghouse Electric Corp. Two other executives of the company are reassigned

Westinghouse Electric Corp has elected two new vice presidents and reassigned two vice presidents.

Robert D. Blasier, who has headed the company's law department office, becomes vice president in charge of industrial relations and a member of Pres Gwilym A. Price's headquarters staff. John E. Payne, who has been manager of the company's central sales district, becomes vice president in charge of the district with headquarters at Pittsburgh, Pa.

Tom Turner, who has been vice president in charge of industrial relations and has had staff responsibility for headquarters manufacturing, becomes vice president in charge of the motor and control division at Buffalo, N. Y. T. I. Phillips, who until recently has been head of the firm's East Pittsburgh divisions, succeeds Turner as staff vice president in charge of manufacturing.

At Buffalo, Turner succeeds L. R. Botsai who resumes the responsibility he previously held as manager of Westinghouse's gearing division at Pittsburgh, Pa. G. H. McBride, who has served in Botsai's absence as manager of the gearing division, resumes his previous position as sales manager of that division.

Active in Labor Negotiations . . . Blasier joined the Westinghouse law department in 1942. He has been the company's legal counsel in labor matters and for years has taken an active part in labor negotiations. Prior to joining Westinghouse, he was with the law firm of Cravath, Swaine, & Moore in New York.

Payne, who will be responsible for sales of industrial products in the Pittsburgh, Cleveland, Detroit, and Cincinnati areas, started with Westinghouse in 1925. He was made manager of the machinery resale section in 1933, manager of industrial sales for the central district in 1934, and headquarters industrial sales manager in 1947. He was appointed manager of the central district in 1949.

Started as a Machinist . . . Turner began with Westinghouse in 1922 as a machinist and was graduated from the Westinghouse Technical Night School at East Pittsburgh in 1929 while he was time study supervisor of the large and small tool departments. He went to the meter division at Newark, N. J., in 1932 to direct time study work, and was named manager of the division seven years later. He was appointed manager of the elevator division at Jersey City, N. J., in 1948 and was elected vice president in charge of that division two years later. Soon after he was transferred to Pittsburgh as director of industrial relations.

Phillips joined Westinghouse in 1915 and one year later was made a foreman. In 1930 he was appointed manager of the works department in the gearing divisions and in 1933 became works manager at the East Pittsburgh divisions. He was named general works manager for the company in 1935, assistant to the president in charge of a headquarters manufacturing staff and elected a vice president in 1941, and took charge of the East Pittsburgh divisions in 1943.

Niagara Mohawk Power Promotes J. M. Geiger

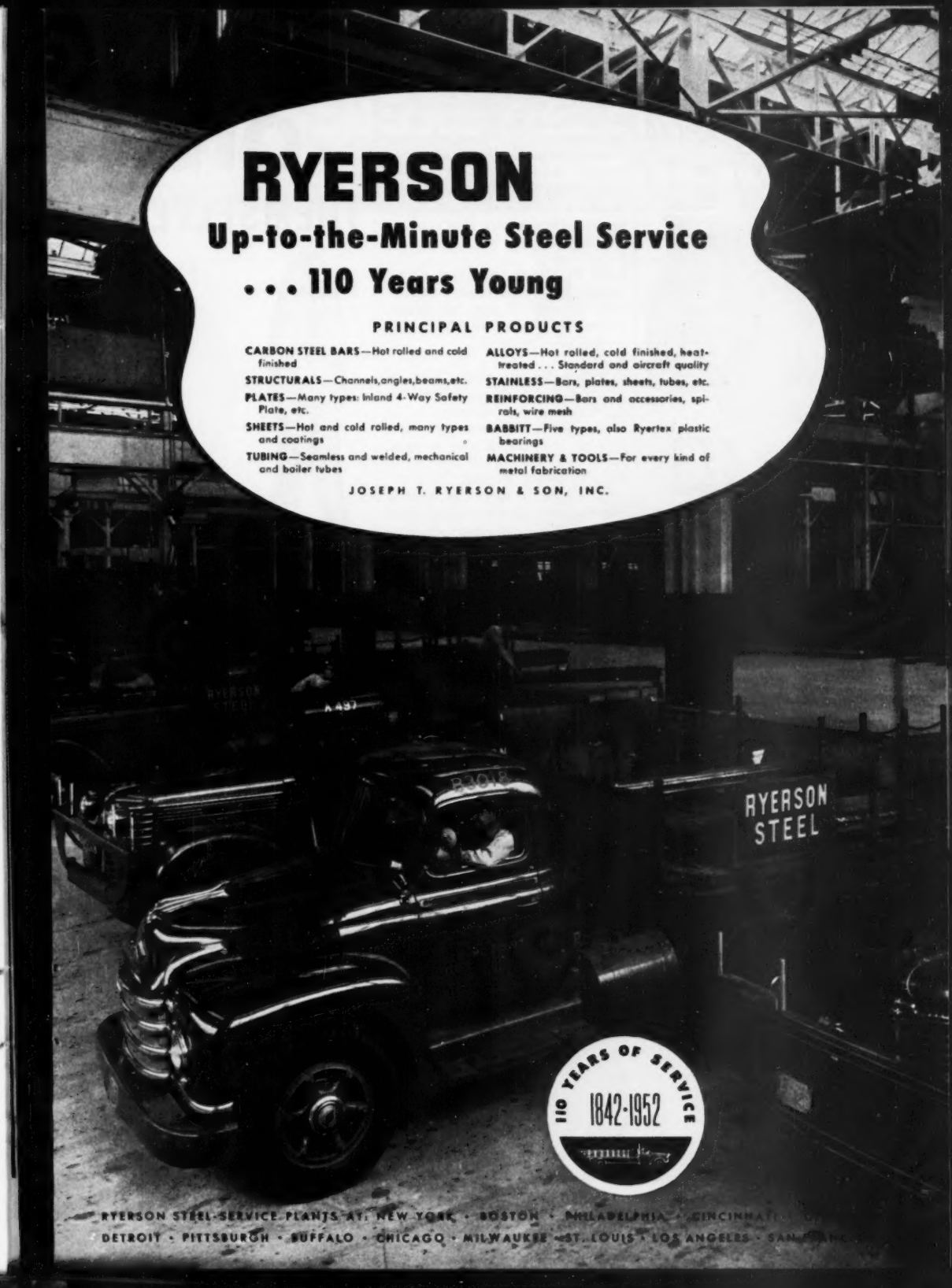
J. Marion Geiger has been named chief electrical engineer for the Niagara Mohawk Power Corp. He succeeds Raymond T. Henry, who has retired.

Geiger has been serving since 1929 as electrical engineer in direct charge of design of the corporation's generating stations, including steam stations at Buffalo, Oswego, Dunkirk and Albany, and the Stewarts Bridge hydro station now under construction at Hadley, N. Y.

He originally started his utility career with the former Cataract Power & Conduit Co in 1910 as a station

J. M. GEIGER

attendant. Two years later he transferred to the office of stations superintendent on general work. In 1915, when Cataract P&C was consolidated with Buffalo General Electric, another Niagara Mohawk Power predecessor company, he was assigned to the engineering department on drafting and specification work. In 1920 he left Buffalo General Electric to join Beaver Board Co of Buffalo. Two



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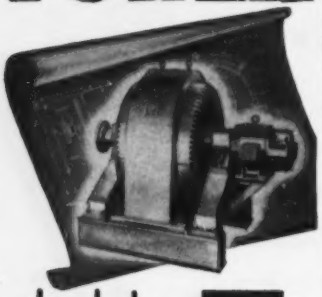

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years later he returned to Buffalo General Electric and served as a draftsman from 1922 until 1929 when he was assigned as an electrical engineer on generating and transmission stations.

Henry is also a veteran of the Niagara Mohawk system, having started with the old Niagara Falls Hydraulic Power & Manufacturing Co in 1909. He was made chief electrical engineer in 1945.

Leroy C. Nichols, New York district manager of Weston Electrical Instrument Corp for 34 years, has retired. Nichols has been associated with Weston since 1914.

Callum Anderson, division manager for Atlantic City (N. J.) Electric Co at Pitman, has been appointed to the newly created post of division manager for the Atlantic City division.

John B. Taylor, assistant vice president, will be in charge of Atlantic City Electric's expansion coordination program, which is designed to broaden the company's participation in area development and community betterment. Anderson, who started with the utility in 1924, will make his headquarters at Atlantic City. Taylor, who has been with Atlantic City Electric since 1946, was made assistant vice president of the company in 1948.

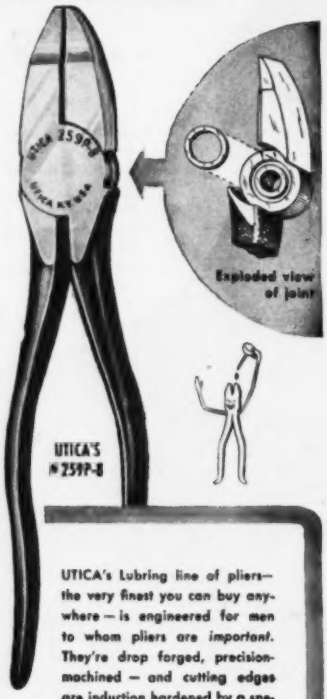
OBITUARY

Fred H. Maidment

Fred H. Maidment, 82, a pioneer in the development of the electric and gas business in Nassau County, N. Y., and former vice president and direc-

F. H. MAIDMENT

PLIERS THAT
OIL
THEMSELVES!



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Each UTICA "Lubring" pliers has a ring of porous iron floating in the joint. This ring serves as a tiny reservoir for oil and releases it to the joint *as it's needed*.

In these days of limited replacements, why not make sure you get the long life and quality that go with UTICA?

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Smooth bore, low coefficient of friction, keep pulling tensions on cables to minimum.

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Long 8 ft. lengths, light in weight speed installations.

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...THE MORNING AFTER

In the middle of the night fire hit here with sudden blasting fury. In *seconds*, it turned vital equipment into smoking junk. Next morning the directors could rightfully ask, *"Where was our fire protection?"*

Unfortunately, it lay in a desk drawer—a proposal for a fire extinguishing system that would have made the key hazards at this plant fire-safe. Procrastination pigeonholed protection . . . and disaster didn't wait!

In generators, transformers, switching equipment and other utility danger spots fire can strike with crippling effect—with ordinary protection helplessly inadequate. That is why, when CARDOX originated "Low Pressure Carbon Dioxide Systems"* many years ago, the first such system went into a central station. The utility industry has since installed many, many more—as the best and safest protection for millions of dollars worth of equipment. CARDOX CO_2, applied in *any* quantity required, holds fire damage to a minimum—and eliminates extinguishment damage entirely.

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FIRE EXTINGUISHING SYSTEMS

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tor of Long Island Lighting Co, died at Sea Cliff, N. Y., Feb. 21.

Maidment began his utility career in 1901 with Roslyn Light & Power Co at Roslyn Heights, L. I., and later worked for Nassau Light & Power Co, both predecessor companies of Long Island Lighting. When Nassau L&P was merged with Long Island Lighting in 1922, he assumed responsibility for the commercial affairs of the Sea Cliff & Glen Cove Gas Co. In 1927 he was elected vice president and director of Public Service Corp of Long Island. The commercial affairs of the company were under his direction until Public Service was merged with Long Island Lighting.

He became a vice president of the Long Island firm in 1929 and a director in 1934. He retired from the vice presidency in 1941 and from the directorship in 1945.

Emil J. Amberg

Emil J. Amberg, 77, retired vice president of Connecticut Light & Power Co, died Feb. 22 at Waterbury, Conn.

Amberg, a native of Switzerland, came to this country in 1908, and worked with Baldwin Locomotive Works, remaining until 1917. He did hydroelectric development work in Pennsylvania and had charge of electrification design and reconstruction

E. J. AMBERG

on the Stamford-New York section of the New York, New Haven & Hartford Railroad. He joined Connecticut L&P in 1917 as an electrical engineer. Later he worked on the construction of the utility's steam plant at Devon and also on the building of two hydroelectric stations on the Housatonic

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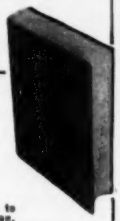

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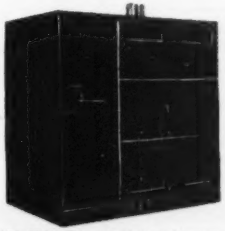

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- SPECIAL

Made by a pioneer in the dry type, air-cooled transformer field. Eliminate need for liquid filled units. No hazardous, inflammable oil or toxic liquid to fuss with. Maintenance of oil level, foreign matter, sludge accumulation, and subsequent filtering are relegated to the "horse and buggy days".

MARCUS DRY TYPE, AIR-COOLED TRANSFORMERS

ARE SAFE — No explosion or fire hazards. No fire proof vaults. Class B and C heat proof insulations.

ARE ECONOMICAL — Lower cost installation and operation, negligible maintenance.

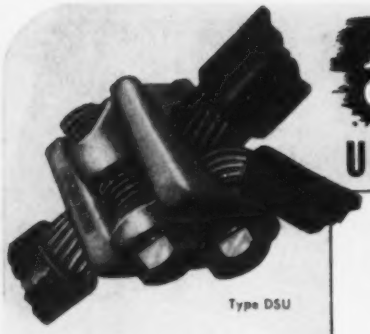
For the transformer that's second to none, specify MARCUS.

Representatives in Principal Cities

MARCUS TRANSFORMERS CONFORM TO THE STANDARDS OF N.E.M.A. AND A.I.E.E.

MARCUS TRANSFORMER CO. INC.
30 MONTGOMERY STREET
HILLSIDE 5, NEW JERSEY

PIONEERS IN THE FIELD OF AIR COOLED TRANSFORMERS



Type DSU

DOSSERT Connectors

UNEXCELLED!

FOR QUALITY...
DEPENDABILITY...
PERFORMANCE...
AT LOW COST

DOSULON

A one-piece bolt type variable service tap. For large size copper cables. Available in conductor sizes from 1/0 to 1,000 MCM. Made of high strength copper alloy and equipped with Duronze bolts. Rugged, compact, facilitates neat taping.

WRITE FOR CATALOG 45-1

VARIABLE HERCULON CONNECTORS

For power distribution jobs. Available in eight sizes to cover range of cable No. 8 solid to 1,000 MCM.

HL-2

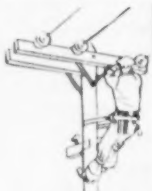
H2L-2

H3L-2

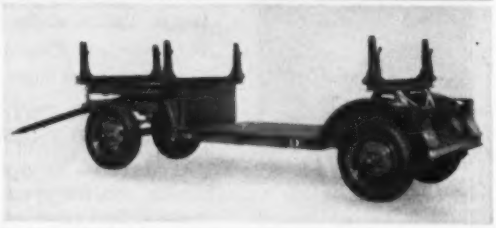
HC

DOSSERT MFG. CORP.

SINCE 1904



DESIGNED TO MEET YOUR NEEDS... in Line Construction and Maintenance



BUILT LOW FOR EASIER LOADING AND HAULING — THE EAGLE 4-WHEEL LO-BED TRAILER

Transformers and other heavy, bulky units are easy to load and carry on this trailer. Big, roomy, low platform. Also suited to pole and general purpose hauling. Full 90° turn with front dolly; 5th wheel type steer. Heavy duty construction; low center of gravity keeps load steady enroute. Equipped with pole bolsters.

5 tons capacity; over-all length, including tongue, 25 ft. 8 inches. Distance ground to low platform only 25-1/2 inches. Weight 5400 lbs. Equipped with electric brakes on rear wheels. Send for complete information on Model 6441—Eagle LO-BED Trailer.

EAGLE

EAGLE MANUFACTURING CO.
Division of
The Four Wheel Drive Auto Co.
APPLETON, WISCONSIN

Utility Bodies • Trailers • Pole Derricks
Tools and Accessories
Eagle equipment is engineered by and for utility men expressly for their needs

Send today for the complete catalog of Eagle Line Construction and Maintenance Equipment — a useful reference book.

River—Stevenson in Monroe and Rocky River in New Milford.

He was elected a vice president of the company in 1946, retiring in 1951.

Louis E. Fischer

Louis E. Fischer, 75, former operating vice president of North American Light & Power Co, died Feb. 15 at Chicago.

In addition to his affiliation with North American L&P, he also acted in his earlier days as a consulting engineer for electric utility and street and interurban railway companies. At the time of his death he was chairman of the board of Kansas-Nebraska Natural Gas Co, Inc.

John W. Van Name, 72, electrical engineer for Kansas City (Mo.) Power & Light Co, died Feb. 13 at Kansas City. He was an employee of the utility from 1928 to 1946, 14 years as an electrical engineer in the heating department.

Joseph E. Yates, 66, retired Pacific Power & Light Co transportation superintendent, died Feb. 13 at Portland, Ore. He served 39 years in engineering posts with PP&L, retiring in 1950. During World War II he served with the contract distribution branch of the War Production Board.

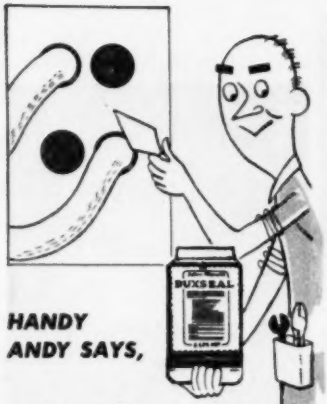
William J. Everett, 51, general manager of the Cuban Electric Co, a subsidiary of American & Foreign Power Co, Inc, New York, died at Havana Feb. 22. He came to Cuba in 1924 to work for Cuban Electric.

Thomas P. Smith, 60, for 23 years chief engineer of the Peabody (Mass.) Municipal Electric Light Department, died Feb. 21.

William Raymond Sprague, an electrical engineer with Duquesne Light Co for 25 years, died Feb. 20 at Bellevue, Pa.

George H. Ritter, 41, manager of the new business department of Northern Pennsylvania Power Co, died Feb. 23 at Towanda, Pa. Ritter, who was named manager in 1941, had been with the company 20 years.

Philip S. O'Dowd, 59, engineering representative of the Electric Storage Battery Co at Boston, died recently.



HANDY ANDY SAYS,

Seal it Quick ...seal it Tight with Johns-Manville DUXSEAL

KEEP A PACKAGE of Duxseal in your tool box for on-the-spot sealing of duct openings, potheads, bushings, terminal boxes—and for filling multi-wire contact boxes indoors. It's a nonhardening adhesive plastic compound with an asbestos base ... goes on like putty just as it comes from the handy package ... provides a smooth, workmanlike job.

Check these 4 important advantages of Duxseal:

Stays plastic—Duxseal stays plastic indefinitely. Will not slump, melt or run under ordinary temperatures.

Stays tight—Clings to duct walls and cables but flexes with expansion and contraction of the cable.

Stays insoluble—Unaffected by ground waters and gases.

Stays harmless—Will not injure workmen's hands or react with rubber, metals or painted surfaces.

Tight seals for other electrical uses:

J-M Transeal . . . for use against refined oils employed in transformers, switches and similar equipment.

J-M Uniseal . . . for caulking equipment outdoors or in fume-laden areas. Resists temperatures up to 180° F.

Let us send you more information about Duxseal and other J-M labor-saving sealing compounds. Just write Johns-Manville, Box 290, New York 16, N. Y. In Canada, 199 Bay Street, Toronto, Ontario.

JM

Johns-Manville SEALING COMPOUNDS

STREET LIGHTING GOES MODERN! WITH AMPLEX MERCURY VAPOR LAMPS

Mercury Vapor Lamps planned for N.Y. City Belt Parkway

MERCURY VAPOR LIGHTS ON VALLEY HIGHWAY, DENVER

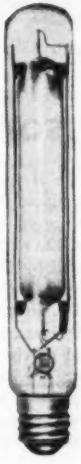
Mercury Vapor for Seattle Tunnel

HERE'S BIG NEWS for municipalities and utilities! The new Amplex Mercury Vapor Lamps for street lighting will provide vastly improved illumination ... and slash costs at the same time!

Compared with incandescents, Amplex Mercury Vapor Lamps give about twice the light for the same wattage consumed ... practically double the illumination without boosting the lighting bill!

Besides that, Amplex Mercury Vapor Lamps have several times the burning life of ordinary lamps ..., afford extraordinary lighting efficiency plus economies never obtainable before.

Note the actual performance facts shown here with the illustrations of Amplex Mercury Vapor Lamps AH-1 and EH-1. And then get the full story on these "lamps of the future". **Just write Amplex Corporation, Dept. J-3, 111 Water St., Brooklyn 1, N.Y.**



400W
AH-1
Approx. Lumens 16,000
Average Life 4,000 hours

400W
EH-1
Approx. Lumens 20,000
Average Life 4,000 hours

AMPLEX

Sealed-Beam Reflector Lamps, Colorbeam Lamps, Spotlites and Floodlites, Industrial Infra-Red Heat Lamps, Vibration and Rough Service Lamps, Street Lighting Lamps, Traffic Signal Lamps, Incandescent Lamps, Fluorescent Tubes, Display Accessories.

Air Conditioning's the Thing

Coming decade will see its upsurge, predicts Price of Westinghouse. Question is, Which models do you promote?

The air conditioning business will be the really big thing to promote in the next decade, Gwilym A. Price, president of Westinghouse Electric Corp, predicted at a recent press conference in New York.

At Westinghouse, said Price, the question is, Which models should be put into wholesale production? The company doesn't have the answer yet, he said, but is looking for it.

And the Heat Pump . . . Part of the promotion, Price thinks, will be directed toward the heat pump. Because the cycle of the pump can be reversed for cooling in summer, it could become a definite factor in air conditioning.

John M. McKibbin, vice president in charge of consumer products, said the company was experimenting with a heat pump that has built-in electric heating panels to handle the winter's coldest dips.

"When are you planning to come on the market with it?" he was asked.

"Now you're prying into our secrets." McKibbin laughed. But he did indicate a commercial model was in the offing.

While the major portion of Westinghouse business will continue to be production of electrical equipment, President Price said, production of consumer products, now 26% of the whole, is expanding at the fastest rate.

The immediate future, he said, would see a proportionately higher increase in the laundry line than in other consumer goods lines.

For the Military . . . Westinghouse hopes to double last year's production for the military, Price said. Military requirement took up 16% of the 1951 operating budget—major undertaking was the prototype submarine reactor being built for Atomic Energy Commission at the National Reactor Testing Station, Arco, Idaho. The president described this as Westinghouse's prime project and said the company was "pleased with its progress."

All signs point to an upward trend in electrical industry growth for the next few years, according to Price. The company's Market Planning Section has set 178 million kw of installed generating capacity as the nation's goal for 1965. This is 102 million kw above that available at the start of 1952, he pointed out.

Greatest Ever . . . The industry's growth, Price said, is evidenced at Westinghouse by the fact that the quantity of power generating equipment now under construction is greater than at any other period in its history. Turbo-generators being built range up to 200,000 kw, largest ever assembled.

"Whether (the country's) great productive effort will be able to continue at its present rate," Price commented, "will depend in large measure upon the framework of price controls and taxation within which industry must operate. If they are equitable, industry will move ahead."

GWILYM A. PRICE: Air conditioning may prove to be wonder industry of next decade

GE Sponsors Conference

General Electric Co is sponsoring a conference and products parts exhibit to be held in Louisville, Ky., March 20-21. About 400 to 500 suppliers of materials used by GE in its manufacture of major household appliances are expected to attend.

According to C. P. Fisher, Jr, manager of materials and purchasing for GE's major appliance division, the meeting has been arranged to acquaint suppliers with the long-range production materials requirements of the division.

All component parts of major appliances manufactured by General Electric, together with the appliances themselves, will be on display. Division administrative, sales, engineering, manufacturing, and product planning executives, headed by the division's general manager, Clarence H. Linder, will speak and be available for personal discussions.

The program will include a tour of the new multi-million dollar Appliance Park project now under construction at nearby Buechel.

Appliance Park, where, ultimately, General Electric will manufacture all of its major household appliances, was involved in a recent production switch. Original plans to make jet engine parts at the Park's No. 1 building were unexpectedly changed when Air Force requirements were rescheduled over a longer period. GE's other facilities can meet the Air Force schedule.

In this production switch, General Electric also has announced it will not seek a fast tax write-off on its new $14 million Louisville plant during any period in which it manufactures appliances.

Production plans for the other planned four Appliance Park manufacturing buildings, one of which also is under construction, remain unchanged. In addition to the five manufacturing buildings, plans call for the erection of an administration building, engineering laboratory, personnel building, a large warehouse, and service buildings.

About 16,000 production, engineering, office, and administrative personnel eventually will be employed when the Park is in full operation.

How you

SAVE ON HOIST MAINTENANCE

Safety-Pulls are available in 10 sizes with capacities from 1,500 to 30,000 lb.

Here are just a few of the "extras" that keep Coffing Safety-Pull Ratchet Lever Hoists on the job — and save on maintenance costs.

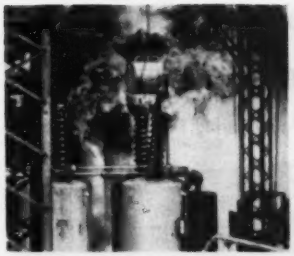
- Hoist frame is certified malleable iron — your guarantee of lasting durability.
- Sprocket and ratchet are special alloy drop-forged steel, heat-treated and ground.
- Chain is specially designed for Coffing Hoists to meet U.S. Navy specifications — and tested at 100 percent overload.
- Hooks are drop-forged, heat-treated alloy steel — will not break or straighten out.
- "Safety Valve" handle will bend before hoist is overloaded beyond maximum safe limits.
- All Safety-Pulls are factory-tested at twice their rated capacity.

Find out more about the hoists that stay on the job — and out of the repair shop. Write Dept. E3SP.

COFFING HOIST CO.
DANVILLE, ILLINOIS

Quik-Lift Electric Hoists • Hoist-Alls • Mighty-Midget Pullers • Spur-Gear Hoists • Differential Chain Hoists • Load Binders • I-Beam Trolleys

SOLD BY DISTRIBUTORS EVERYWHERE



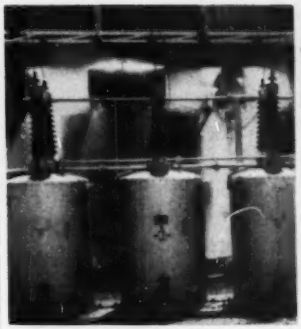
PROTECTING

flammable, oil-filled

TRANSFORMERS

with time-tested, rapid extinguishing

GRINNELL MULSIFYRE



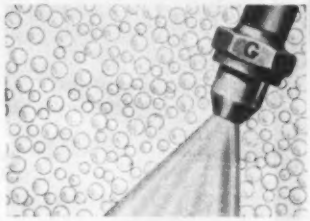
In case after case, where Grinnell MULSIFYRE has been on guard, hazardous oil fires have been effectively controlled — damage limited. For example . . .

● On August 2, 1944, a fault occurred on the 26 KV ring bus at a substation of the Public Service Electric & Gas Co., Harrison, New Jersey. Following the tripout, the operator noticed the end bay, where the transformer was located, to be ablaze. He immediately activated the electrical control operating the Grinnell MULSIFYRE System, deluging the transformer banks with water spray and extinguishing the fire.

● At a substation of the Omaha Public Power District, Omaha, Nebraska, two 25-year-old three phase 6250 KVA 13.2-2.3 KV water-cooled indoor type transformers were protected by a MULSIFYRE System automatically actuated by Quartzoid Pilot Sprinklers. On August 30, 1944 a minor explosion occurred, setting the transformer afire. The Grinnell MULSIFYRE System went into operation immediately, and there was no fire damage.

● In 1948, a lightly built wooden sawing shed was erected by the Singer Manufacturing Company, Bridgeport, Connecticut, adjacent to a bank of three 500 KVA transformers. A fire started in the shed, apparently when a carelessly discarded cigarette or match ignited sawdust, and quickly burned through the roof. The MULSIFYRE System operated over the exposed transformers, preventing damage to them.

Stop future trouble and expense. Get complete facts *now* on reliable Grinnell emulsion-forming spray systems. Write Grinnell Company, Inc., Providence, R. I. Branch offices in principal cities.



GRINNELL *Mulsifyre*

EMULSION-EXTINGUISHMENT OF OIL FIRES

Fast, low-cost instrument and relay testing is here!

Double your testing efficiency... Halve your testing time with this new

BOOTH POWER SUPPLY UNIT

You save time by eliminating the need for collecting, connecting and checking the many components required. You eliminate cumbersome equipment. And you add greater safety for personnel.

Proof? Booth All-In-One Power Supply Units are in use today by leading utilities, industries and government agencies. Names on request! Write for detailed information.

Arthur E. Booth Company
4124 Beverly Boulevard
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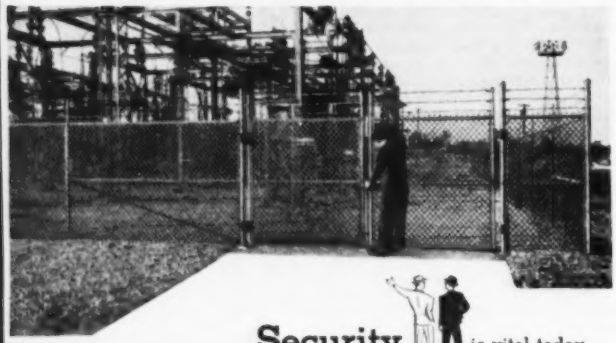
PAGE FENCE *-Since 1883*

• AMERICA'S FIRST WIRE FENCE •



Security is vital today as never before. Protection at property lines has been the responsibility of Page Chain Link Fence for more than 60 years. There are fence styles and gates to meet any protective need. The expert erecting firm near you will supply facts and submit cost estimates without obligation. Firm name will be sent with fence data on request.

Write to PAGE FENCE ASSOCIATION in Monessen, Pa., Atlanta, Bridgeport, Chicago, Denver, Detroit, Los Angeles, Philadelphia, New York or San Francisco.

PRODUCT OF PAGE STEEL & WIRE DIVISION OF AMERICAN CHAIN & CABLE COMPANY, INC.

Copper Savings . . .

. . . are possible with copper-covered steel wire, according to Copperweld Steel executive

"Estimates show that practical applications for copper-covered steel wire in electrical, electronic, communication, aircraft, and automotive production can save approximately 50 million lb of copper annually," according to William J. McIlvane, executive vice president, Copperweld Steel Co. McIlvane made this statement to DPA and presented a booklet on copper saving opportunities.

The booklet points out that in numerous applications, the copper wires traditionally used are larger than need be from an electrical standpoint. This is done to insure sufficient strength. Smaller copper conductors are not feasible. They have ample current-carrying capacity but are not strong enough. In copper-covered steel wires, which save 70% of the copper, there is adequate copper for the electrical work, together with steel which furnishes the strength.

McIlvane also indicated that copper-covered steel wire weighs 8% less than copper, size for size, and soldered joints and other electrical connections are made as easily as with copper.

Potential annual savings in electric power transmission, distribution, and allied fields made possible by converting to Copperweld wire as compared with estimated usage of copper wire were outlined as follows:

	Estimated Usage (Millions of lb)	Potential Savings (Millions of lb)
Pole grounding wire	12.0	8.4
Lightning arrester and neutral grounding	12.0	8.0
Insulator tie wire	0.5	0.4
Primary distribution taps	6.0	5.0
Electrical appliance cords	25.0	7.5
Appliance wiring	12.0	6.0

To achieve some of the above savings, changes will be required in existing codes and regulations. It is believed these can be accomplished without reduction in operating performance.

Pole protection grounding, lightly loaded rural lines, and tying copper-type power conductors to insulators are examples of good applications in the electric transmission and distribution fields. According to McIlvane, orders for copper-covered steel grounding wire have increased several hundred per cent in the last three months when this application was called to the attention of the industry.

P-L EARTH ANCHORS

FOR ANY JOB FROM THE SMALLEST LINES TO POWER TRANSMISSION LINES

All P-L Steel Expanding Earth Anchors are designed to give maximum holding power with minimum installation cost.

P-L 2-WAY ANCHOR (6" & 8" DIA.)

Six sizes—with nominal holding power classifications from 2500 to 12,000 pounds.

P-L 4-WAY ANCHOR (8" DIA.)

Three sizes—with nominal holding power classifications from 6000 pounds to 10,000 pounds.

P-L 4-WAY ANCHOR (10" dia.—effective area expanded, 200 square inches) HEAVY-DUTY

One size for transmission and heavy distribution lines with nominal holding power classification of 20,000 pounds.

Write today or contact your preferred distributor for information and literature.

PIEPER-LILLARD, INC.
ST. LOUIS 22, MISSOURI
MAKERS OF WIRE STRINGING PULLEYS
CHAIN BINDERS • SPREADING TOOLS
SADDLE ASSEMBLIES

New Electrical Construction

New electrical construction projects announced by private and government utility systems involving more than $70,000. Also listed are major industrial and construction jobs where electrical work is included.

UTILITIES

Proposed Construction

Arizona—Bureau Reclamation, Dpt. Interior, Davis Dam, Ariz., 68-kv Davis Switchyard and Transformer circuit, Davis Dam Proj. 30 mi. west of Kingman, Spec. DC 3679.

Ark., Jonesboro—Jonesboro Water & Light Plant, Jonesboro, constr., instal. 7,500 kw. power plant. $1,000,000.

Calif., Vallejo—P. Wk. Office, Twelfth Naval Dist., Federal Office Bldg., Civic Center, San Francisco, replacement 2300 volt electrical feeder of U. S. Naval Hospital, Mare Island Naval Shipyard, NOY 28921, Spec. 30526. Plans deposit $10.

La., Shreveport—U. S. Eng., 300 Broadway, Little Rock, Ark., Job No. Barksdale Air Force Base, A51-3A (Item 7) power service for transmitter adjacent to Bossier City, in Bossier Parish, Eng. 03-050-52-36.

Mass., Boston—State, Dpt. P. Health, State House, service bldg. and power plant, for Chronic Disease Hospital, Franklin Park off Morton St. $1,200,000. M. A. Dyer, 24 School St., archt.

Mass., Pittsfield—General Electric Co., 100 Woodlawn Ave., factory, Woodlawn Ave. $500,000.

Mississippi—East Mississippi Electric Power Assn., Meridan, soon lets contract 204.2 mi. rural distr. lines. Clarke and Lauderdale Counties, Allen & Hoshall, 65 McCall Pl., Memphis, Tenn., engrs.

Montana—Bonneville Power Admin., 827 N.E. Oregon St., Portland, Ore., Inv. 6317, Schedule 2, Hot Springs-Anaconda 230 KV line, 35.6 mi., Missoula and Granite Counties. Plans deposit $25. T. C. Stewart, c/o owner, engr.

Nebraska—Cornhusker Rural Public Power Dist., Columbus, 3 sub-stations, 1 each at Fullerton, Humphrey and Spaulding, $600,000. R. H. Reed & Co., Columbus, consult. engrs.

Nebraska—Consumers Public Power List., Columbus, 39 mi. transmission lines, Cherry Co. $100,000. R. L. Schacht, c/o owner, ch. engr.

S. C., Charleston—Dpt. Navy, Officer in Charge of Construction, Box 365, Naval Base, S. C., furnishing, installing 250 kw 2300 volt 3 phase diesel driven generator for emergency power Naval Ammunition Depot, NOY 70675. Plans deposit $10.

Tex., Fort Hood—U. S. Eng., 606 Santa Fe Bldg., Galveston, construct electroencephalograph facilities and air conditioned clinic, Station Hospital. Inv. No. ENG 41-243-52-68.

Tex., Fort Worth—Hydro-Aire, Inc., 3000 Winona Ave., Burbank, Calif., 30,000 sq. ft., concrete-walled, temperature controlled defense plant, west of hy. 183. $1,000,000.

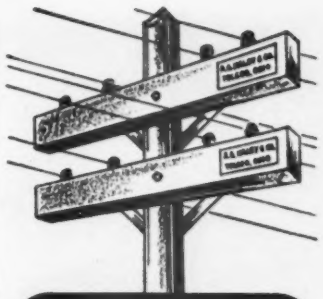
Wyoming—Niobrara Electric Assn., Lusk, 205 mi. rural distr. lines and changes in 63 miles, Niobrara Co. $200,000. C. H. Guernsey & Co., 2701 N. Oklahoma St., Oklahoma City, Okla., engrs.

Alaska—Bureau Reclamation, Dpt. Interior, Palmer, Construct Eklutna-Anchorage 115 kilovolt transmission line, Eklutna Proj. Spec. DC 3672.

Low Bidders & Contracts Awarded

Kans., Kansas City—Lock Joint Pipe Co., Turner Kan., LB $167,780. Contr. K-13, concrete power station pipe. Bd. P. Utilities, Kansas City, Kan. Burns & McDonnell Eng. Co., 95 and Troost Sts., Kansas City, Mo., engrs. Bids Feb. 13.

Oregon—Western Electrical Constr. Co., 1223 N. W. Lovejoy St., Portland, Ore., CA. $150,448, constr. St. John Sub-station addns. and storage bldg., Inv. 6290, Bonne-



CEDAR POLES
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FIR CROSS ARMS
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Latest and most modern facilities for **PENTA** CHLOROPHENOL TREATING
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LONG LIFE
CLEANLINESS
LIGHT WEIGHT
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TWO Strategically Located Yards:
Minneapolis, Minn.
Findlay, Ohio

R. G. HALEY & CO.
SPITZER BLDG.
TOLEDO 4, OHIO

De luxe service— *with lights*

IN JUNE of 1887 it cost extra to ride in a train fully equipped with electric lights. That's when the Pennsylvania Railroad placed the first fully electrically lighted train in service . . . the Pennsylvania Limited between Chicago and New York.

When this was news, Hemingray already had seventeen years' experience in designing and manufacturing pole-line insulators.

In fact, for more than eighty years now, the name Hemingray has been synonymous with quality and leadership in the manufacture of glass insulators for overhead lines. Continued dependable performance in actual operation has made Hemingray an accepted standard in the industry.

HEMINGRAY
POWER INSULATORS
AMERICAN STRUCTURAL PRODUCTS COMPANY
Muncie, Indiana

Subsidiary of Owens-Illinois Glass Company

ville Power Admin., 827 N. E. Oregon St., Portland, Ore. Bids Feb. 20.

Wash., Fort Lewis—Agutter Electric Co., 952 E. Seneca St., Seattle, Wash., LB, $145,700, est. $141,500, electrical distr. sys., permanent troop facilities, inv. 52-140. U. S. Eng., 4735 E. Marginal Way, Seattle, 4, Wash. Bids Feb. 21.

Alaska, Kenai—Patti Constr. Co. and MacDonald Building Co., 1540 Admiral St., Kansas City, Mo., LB $7,131,842, est. $10,971,135, Army communications station, Inv. 52-15. U. S. Eng., (APO 942, c/o PM, Seattle, Wash. Anchorage, Alaska. Bids Feb. 14.

Ont., Toronto—Foundation Co. of Canada Ltd., 1226 Bay St., Toronto, Ont., CA, $100,000, steel, 24x30 ft., television relay stations at Uxbridge, Bethany and Hastings. Bell Telephone Co. of Canada, 76 Adelaide St. W., Toronto, Ont. Bids Nov. 29, awarded Feb. 18.

Ontario—Cook & Leitch Ltd., 5035 Western Ave., Montreal, Que., CA, $270,-000, television relay stations at Stanley Corners, Smith Falls and Westport. Bell Telephone Co. of Canada, 76 Adelaide St. W., Toronto, Ont. Wallace, Carruthers & Assoc., Ltd., 35 Isabella St., Toronto, Ont., engr. Awarded Feb. 19.

INDUSTRIAL, COMMERCIAL & PUBLIC BUILDINGS

Proposed Construction

Calif., La Habra—Beckman Instruments, Inc., 820 Mission St., South Pasadena, replace plant at Imperial Blvd. and Hy. 101. $1,000,000.

Calif., Los Angeles—Bd. Supervs. Los Angeles Co., Hall of Records, construct Juvenile Hall, $3,050,000. Kauffman & Stanton, 627 S. Carondelet St., archts.

Conn., Stonington—Town, Bd. of Edu., plans by Chas. A. Maguire & Assoc., 1015 Turks Head bldg., Providence, R. I., 2 story, brick, steel, concrete high school, $1,600,000.

Ill., East St. Louis—Bd. Educ., School Dist. 189 of St. Clair Co., Bd. Educ. Bldg., 240 N. 6 St., plans by Albert M. Goedde, 1452 State St., brick, rein.-con steel high school, on 30½ acre site, 51 and State Sts., $3,000,000.

Md., Essex—Chesapeake & Potomac Telephone Co., 320 St. Paul St., Baltimore, 1 story, part bsmnt., 95x144 ft., brick, rein.-con., steel **Essex Dial Center**, $1,222,-000, Taylor & Fisher, 1012 N. Calvert St., Baltimore, archts. **Frank N. Knease**, 1504 Woodland Terrace, Phila., Pa., struct. engr. Moody & Hutchinson, 1420 Walnut St., Phila., Pa., mech. engrs.

Mass., Lawrence—City, City Hall, plans by Perley F. Gilbert & Assoc., Inc., 53 Central St., Lowell **Alexander B. Bruce** Elementary School, on site bounded by Providence, Milton and Butler Sts. $2,000,000.

Mich., Gratiot—J. L. Hudson, 1206 Woodward St., Detroit, plans by Victor D. Gruen, 1903 Industrial Bldg., Detroit, Eastland Shopping Center, incl. residential proj., main store Hudson Department Store, parking facilities, etc. on 200 acres, Eight Mile Rd. and Kelley Rd., $10,000,000.

N. Y., Forest Hills—Samuel Lefrak, c/o George Miller, archt., 19 W. 44 St., New York, Zone 36, 6 story apartment, 68 Ave., east of Queens Blvd. $1,000,000.

N. Y., New York—New York Telephone Co., 140 West St., Zone 7, N. Y., plans by Voorhees Walker, Foley & Smith, 101 Park Ave., Zone 17, 5 story exchange bldg. addn., 221-27 E. 37 St. $1,000,000.

O., Youngstown—Erie R. R. Co., I. H. Schram, ch. engr. Midland Bldg., Cleveland, Zone 15, 2 story with 2 bays, 128x170 ft., brick lower and metal siding upper diesel-electric locomotive repair shop at Brier Hill Yards, $1,000,000-$1,500,000.

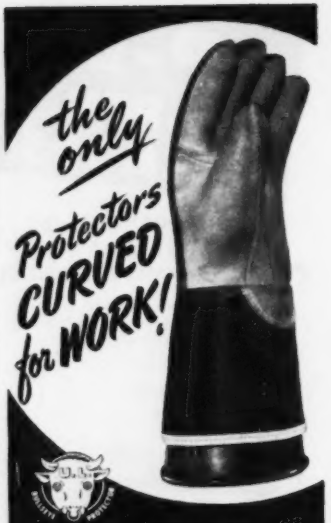
Okla., Ardmore—Bell Oil & Gas Co., National Bank Tulsa Bldg., Tulsa, enlarging refinery, $2,000,000. Refinery Engineering Co., Cribit Bldg., Tulsa, consult. engr.

S. C., Kershaw—Kershaw Co., Kershaw, hospital, $2,000,000.

Tex., Dallas—City of Dallas, City Hall, Main and Harwood Sts., and Dallas Co., Court House, Dallas, 550-bed, masonry city-county hospital and clinic, $7,000,000, De Witt & Swank, 2025 Cedar Springs Rd., archts.

Va., Arlington—Arlington Bd. Educ., 1426 N. Quincy St., plans by Rhees Burket, 1223 Connecticut Ave. N. W., Wash., D. C., construct Wakefield Junior-Senior High School, $4,000,000.

Que., Varennes—Shawinigan Chemicals Ltd., 600 W. Dorchester St., Montreal, plant, $7,000,000.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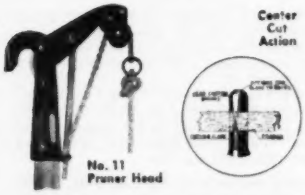

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BOOK REVIEWS

Engineering Dictionary

Engineers Illustrated Thesaurus. By Herbert Herkimer. Published by Chemical Publishing Co, Inc, New York, N. Y. 572 pages, illustrated. Price $6.00.

Anyone setting out to concoct an illustrative dictionary of technical concepts should expect to face difficulties in selection of material for inclusion. First, should it be embracive of all engineering or should it be confined to basic principles regardless of field of engineering? Also should it deal primarily with diagrammatic representations or with the actual physical execution of these principles in terms of commercial examples? The author has chosen whichever of these approaches appeared to be most informative. The electrical will be found to be largely schematic in academic terms but other fields to which electrical engineers may have occasion to refer will be more indicative of physical configuration. There are thus some 8,000 diagrams across such fields as fastening devices, adjusting devices, supports, mechanical movements, handling apparatus, gas and liquid transmitters, prime movers, transportation, processes and electrical appliances.

Wave Theory

The Theory of Electromagnetic Waves. Published by Interscience Publishers Inc, New York 1, N. Y. 393 pages, illustrated. Price $6.50.

A symposium was held at New York University in June 1950 for the purpose of extending the mathematics of electromagnetic wave theory and this book comprises the papers of the sessions. Results of experimentation are presented as well as the mathematical refinement of the art as needed for aviation communciation in the armed forces. Objective of the publication is to stimulate interest in intensive study of the lithosphere (earth), hydrosphere (seas) and ionosphere for better understanding of propogations encountering all three. Elliptics, wedge and edge diffraction, stratification phenomena and those of non-homogeneity of the atmosphere are typical essay topics.

Radio Servicing

Radio and Television Receiver Troubleshooting and Repair. By A. A. Ghirardi and J. R. Johnson. Published by Rinehart Books, Inc, New York 16. 822 pages, illustrated. Price $6.75.

Mobile radio and other communication sets have a special chapter assigned to them and it goes thoroughly into the ways in which such assemblies differ in design and manifestation of troubles. Taken in conjunction with the very detailed discussion of the frailties in home receivers (AM and FM), television, players, and recorders the whole affords a penetrating and practical understanding of what can go wrong in components, how to recognize it, find it, and fix it. Nor should this be construed as indicating a mere service manual because it gives the reasons as well as the symptoms. The diagnostic tabulations and redraft of circuits to give facility in tracing the "run-down" systematically are strong, helpful features.

Network Analysis

General Network Analysis. By W. R. LePage and S. Seely. Published by McGraw-Hill Book Co, New York 36. 516 pages, illustrated. Price $8.

This is another in the McGraw-Hill Electrical and Electronic Engineering Series. The text is a highly mathematical approach to general network analysis and emphasis is placed on communication networks. Designed to provide a background for more advanced work in this field, it

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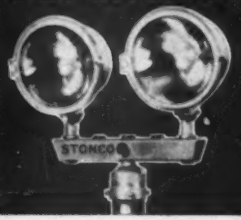

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is a book for engineering students. Much emphasis is placed on terminology used in network analysis. Two chapters are devoted to the Fourier and LaPlace integral, and one chapter to symmetrical components.

Electrical Engineering

Fundamentals of Electrical Engineering. **By Fred H. Pumphrey. Published by Prentice-Hall, Inc, New York. 662 pages, illustrated. Price $7.65.**

This book is designed as a text for students in other fields of engineering who desire an insight into the fundamentals of electrical engineering and such electrical equipment as motors, generators, transformers, rectifiers and electronic apparatus. It also may be used as a text for beginning students in electrical engineering and as a reference during their early professional life. The reader is assumed to have a knowledge of basic calculus.

Of particular interest to the student engineer should be the discussion of industrial applications of electric motors, the use of electricity in heating, welding and electrochemical processes, and the economic and maintenance factors dealing with electric power.

Electronics

Basic Electron Tubes. **By Donovan V. Geppert. Published by McGraw-Hill Book Co, Inc, New York. 325 pages, illustrated. Price $5.00.**

In an attempt to explain the characteristics of electron tubes for the benefit of students of electronics, the author covers the tubes themselves and not in circuit applications in which they are used. In developing this new idea, the text discusses physical and electrical characteristics, theory and mathematics of the eleven basic types of electron tubes used in engineering. Special tubes such as photomultipliers and multigrid mixers are excluded but the basic principles governing their operation is discussed in connection with the basic types. In addition, the book is good preparation for study of microwave electron tubes.

The author's approach is from a practical viewpoint, but essential theory and mathematics are not sacrificed to gain this end. The student is assumed to have a knowledge of mathematics as advanced as differential equations.

Electrical Machinery

Equivalent Circuits of Electric Machinery. **Gabriel Kron. Published by John Wiley & Sons, Inc, New York. 252 pages, illustrated. Price $10.00.**

The most striking fact about this book is that it departs from the practice of gleaning from the works of other authors material for a technical reference work. Before the completion of this book only the simplest of equivalent circuits were known and of the remaining circuits about 30% appeared in print in the last ten years. About 65% of the equivalent circuits represented in the book appear for the first time and originated with the author.

This is the first book written on equivalent circuits in general and on equivalent circuits of electric machinery in particular. Without the aid of any mathematics, it develops the theory of equivalent circuits for all rotating electric machines based on a physical picture of the magnetic and electrical structure of the various machines. It places emphasis on the determination of interconnected-machine performance, not merely on performance of single machines. The circuits developed can be used to establish transient or sinusodial "transfer functions" of rotating machines used in servomechanisms and in system controls.

In short, the book provides the basic foundation for solving a great variety of problems on power systems and electric rotating machinery.

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CATALOGS • BULLETINS

● **HIGH VOLTAGE WIRING**: The Construction Materials Division of the General Electric Co has published a booklet, 16-571-A, covering higher-voltage wiring for office buildings with fluorescent lighting controlled by low-voltage remote-controlled switches. A discussion of the savings of installed cost of equipment and wiring is included. General Electric Co, Bridgeport 2, Conn.

● **METAL AND ALLOYS**: Brief facts about Ampco metal and other Ampco alloys is the title of a new catalog released by Ampco Metal, Inc. Cost-saving information about the uses of Ampco metal in bearings, gears, cams, dies, wear strips, etc, is given. Write for Bulletin G-1, Ampco Metal, Inc, 1745 So. 38 St, Milwaukee 46, Wisc.

● **STEAM TURBINE GENERATORS**: Design and construction features of A-C "WA" series steam-turbine generator units manufactured in NEMA ratings of 2000 to 7500 kw are described in Bulletin 03B7654. Cross section views of each of the turbine types are shown, as are cross sections of the team-turbine generator unit. Allis-Chalmers Mfg Co, 932 S 70 St, Milwaukee, Wisc.

● **A C GENERATOR**: The windcharger ac standby power insurance generator is described in this new catalog. Description of units available and applications are included. Windcharger Corp, Sioux City 2, Iowa.

● **MONOGAS GENERATOR**: A new 8-page booklet describes the packaged Monagas generator and application uses of this combination exogas generator and CO_2 removal system. Construction details and dimensions of the combined unit are provided. Schematic diagrams show how the Monogas generator works. For bulletin DB-28-825, write Industrial Heating Dept. Westinghouse Electric Corp, Meadville, Pa.

● **FLUID PROCESSING**: The application of a wide range of equipment to precision processing of fluids—liquids, air and other gases are described in Bulletin S-7.3. Eight types of equipment used in fluid processing are illustrated. Selas Corp of America, Philadelphia 34, Pa.

● **AIR CONDITIONING EQUIPMENT**: A 16-page condensed catalog B-5164 lists the full line of equipment for air conditioning, for air handling and air cleaning offered by Sturtevant. Specifications and capacity data are in considerable detail. A section is also devoted to electronic air cleaning equipment. Write Dept T, Sturtevant Div, Westinghouse Electric Corp, Hyde Park, Boston 36, Mass.

● **CERAMIC PRODUCTS**: A new 32-page catalog, No. 951, on Steatite ceramic products has been published. Drawings and dimensions of products such as tubing, coil forms, stand-offs, strains, assemblies, appliance parts, bushings, etc are included. A section is also devoted to standards for electronic grade ceramics. Stupakoff Ceramic and Mfg Co, Latrobe, Pa.

● **MOTORS**: This new bulletin describes Marco shaded pole motors, single speed, two speed or three speed. Complete engineering data on these motors is presented. Marco Industries, Inc, Terrace Blvd, Depew, N. Y.

● **SUBWAY STYLE OIL SWITCHES**: Bulletin DC51 describes the type "PK" subway style manually operated oil switches for full-load break cable sectionalizing. The complete line of switches is described with engineering data and application uses. Write to the G & W Electric Specialty Co, 7780 Dante Ave, Chicago 19, Ill.

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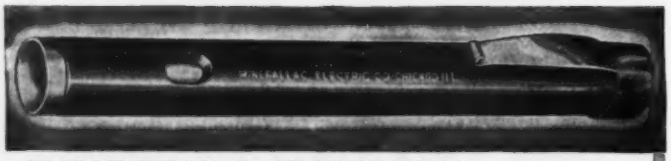

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Ceramic Engineering—Engineers Council for Professional Development has prepared a bibliography of engineering subjects as pertain to ceramic engineering. More than 150 items under 15 classifications are presented. Some topics covered are abrasive and grinding wheels, cement, glass, limes and plastics, ceramic glazes, refractories, structural clay products and others. Copies of 8-page bibliography may be obtained for 25¢ from ECPD, 29 West 39 St, New York 18, N. Y.

Corrosion Instruments—*Reference Book on Instruments for Electrolysis, Corrosion and Cathodic Protection Testing* has been prepared by the AGA. This 48-page text contains data on characteristics and use of corrosion instruments and testing equipment. Manufacturers' catalog sheets showing current models of electrolysis, corrosion and cathodic protection instruments are included. Copies available for $1.50 from American Gas Association, 420 Lexington Ave, New York 17, N. Y.

Welding Electrodes—*Nickel-Molybdenum-Vanadium Alloy Steel Shielded Arc Welding Electrodes (Low Hydrogen Type)* is a 19-pg booklet complete with illustrations, diagrams, charts by welding specialists of the Industrial Test Lab, Philadelphia Naval Shipyard. Operating characteristics, welding procedure, and importance of low moisture content in electrode coating are described. Results obtained with commercial rods that produced, without preheat in high strength steels, crack-free welds which consistently exceeded 110,000 psi yield strength with maximum ductility are summarized. International Nickel, Dept EZ, New York 5, N. Y.

Photoelastic Stress Analysis—Eastman Kodak Co has prepared a revision to its publication *Photoelectric Stress Analysis*. The booklet points out that this method of stress analysis is one of the most effective for stress analysis. It also discusses the principles of photoelasticity including polarized light, double refraction or birefringence, isochromatic lines, isoclinic lines, circular polarization and stress patterns. Available through Kodak dealers.

Motors and Generators—The booklet, *Protective Maintenance of Motors and Generators*, has been prepared by NEMA. The manual covers dc and ac motors, classification of insulating materials, classification of coils, engineering information and definitions of parts for ac and dc motors and generators. National Electrical Manufacturers Assoc, 155 E 44 St, New York 17, N. Y.

Acoustics—A standard on *Acoustical Terminology* has been prepared recently by the ASA. Terms and definitions, tables of related data, cross references and new concepts in acoustics are included in this paper. Write the American Standards Assoc, 70 E 45 St, New York 17, N. Y. for Z24.1-1951, priced at $1.50 per copy.

Short Circuit Testing of OCBs—A British publication, *Interpretation of Standard Rules Governing the Short-Circuit Testing and Artification of Oil Circuit-Breakers* has been released. This publication has been prepared to insure uniformity of test procedure and judgment of performance between test stations. The Assoc of Short-Circuit Testing Authorities, 36 & 38 Kingsway, London, W.C. 2.

Welding Data File—A new *1951 Data File of Defense and Maintenance-Conservation Welding Problems* has been prepared. The data file contains over 100 pages of illustrated technical data on maintenance and repair, welding problems and procedures. Also included are data sheets on a full line of over 160 different Eutectic low temperature welding alloys and latest developments in this field. Dept P, Eutectic Welding Alloys Corp, Flushing, N. Y.

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1	3333	West.	132000—7620/13200 Y
3	1000	Wag.	69000—7200/12470
3	75	A. C.	66000-24000—7200/12470 Y
4	2300	West.	44000—11000
3	100	G. E.	44000—2300
3	75	West.	44000—7200/12470 Y
3	8333	West.	43800—13800
1	18750	A.B.B.	34840—11000, 3 ph.
3	100	West.	33000—240/480 NEW
3	100	A. C.	33000—7200/12470 Y
3	75	Wag.	33000—7200/12470 Y
3	50	G. E.	33000—2300/4000 Y
3	50	Kuhl.	33000—7200/12470 Y
4	450	A. C.	25410-44000—13280/23000
6	100	G. E.	22000—7200/12470 Y
9	50	G. E.	22000—2300
3	37½	G. E.	22000—6900
3	600	G. E.	13800-6900—480
3	480	G. E.	13800-6900—480
6	200	G. E.	13200—2300
3	100	West.	7200/12470 Y—2400
4	50	G. E.	7200/12470 Y—2300
6	25	Mot.	7200/12470 Y—120/240
3	500	Pitts.	6900/11900—550
3	333	Pitts.	6900/11900—550
3	150	Wag.	6900—2300
3	200	G. E.	6900/11430—575
2	150	West.	4800/8315 Y—480
6	50	West.	2730—110/220
1	100	G. E.	2300—575, 3 ph
3	100	West.	2300—460/230
3	75	Mot.	2400—120/240

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2—46 KVA West. 200/400 A. 2300 V.
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Amp: 13,000
Type: HCC-24
Speed: 300
Form: P
Serial: 5226957
Mfg.: General Electric
Cycle: 60

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Type: AH
D-C Volts: 30
Form: P
Phase: 6
Armature amp: 6500
Speed: 300
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Serial: 5226958
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25 cycle
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5,280 kva
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125% load 2 hours 60° C rise following full load continuously.

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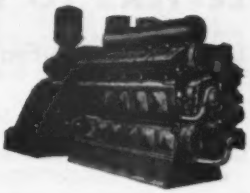

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1420	Fairbanks Morse	38D8⅛	1600	720	330	Superior	KNA	390	514
1250	General Motors	16-278A	1600	720	312	General Motors	8-268A	450	1200
937.5	General Motors	12-567	1060	720	312	Clark	MD-4	375	327
625	Alco	6-12½x13T	750	600	128	Ingersoll Rand	5	225	514
435	Baldwin	VO-6	510	450	187	General Motors	3-268A	150	1200
400	Buckeye	80	480	600	75	General Motors	6042C	90	1200

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Qu	KW	Make	Desc.
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1—	500	Moore	Non-condensing 150/200 lbs I.S.P. 5/25 lbs. G.B.P. 3/60/480 volts Direct Connected Exciter
1—	400	Westg.	Non-condensing — 125/150 lbs. I.S.P. 5/10 lbs. B.P. — 240/480 v. 3 ph. 60 cy.
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SYNCHRONOUS CONDENSERS

KVA	Make	Type	Volts	Speed
1—5000	Whse.		2400/4150	600

MOTOR GENERATOR SETS
3 ph. 60 cy.

Qu	KW	Make	Speed	DC Volts	AC Volts
2—	2000	G.E.	500	666 2S cy	11000
1—	1500	G.E.	720	600	13200
1—	1500	G.E.	360	275	2200/4400
1—	1000	G.E.	900	200	4100/6900
1—	1500	G.E.	600	600	2300/4150
2—	1000	Whse.	900	600	2300/4150
1—	500	Whse.	900	250	6600/13200
1—	500	Whse.	1200	125/250	2300
1—	500	Whse.	900	250	440
1—	500	G.E.	720	125	2300
1—	400	G.E.	720	250	440/2300
1—	350	G.E.	900	125	4150
1—	150	G.E.	1200	275	2300
1—	150	Whse.	1200	275	2300

TRANSFORMERS—60 Cycle

KVA	Make	Type	Ph.	Voltages
3—1065	G.E.	OISC	3	22860/13200x2300
1—1250	Whse.	OISC	3	13200x525
3—1250	G.E.	HVDDJ	1	6600x550
3—1000	Pitts	OISC	1	22000x13200/2200
3—1000	G.E.	HVDDJ	1	2300x480
3— 500	A.C.	OISC	1	13200/2300

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1—1500 KVA G.E., 3 Ph., 4150V, 2300V Pyranol
1— 200 KVA G.E., 3 Ph., 2400-220 Sec.
3— 100 KVA Wagner, 1 Ph., 240V pri., 120V sec.
2— 100 KVA Newark, 440V 3 Ph., 220V 2 Ph.
6— 50 KVA G.E., 1 Ph., 13,450V, 120/240 Sec.
2— 25 KVA G.E., 1 Ph., 11,500V pri., 230/460V sec.
3— 25 KVA G.E., 1 ph. 550V. pri., 110/220 sec.

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1— 150 KW G.E., 125/250V, 1200 RPM, 2300 Syn.
1— 100 KW G.E. 250V 900 RPM, 2300V. Syn.
1— 75 KW Cr Wh, 250V, 1200 RPM, 2300/3150V Syn.

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1—2000 HP G.E., MT, 257 RPM 6600V.
1— 250 HP West., CW, 500 RPM, 440V.

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1—2500 KVA Whse., 720 RPM, 2200V with DC EXC.

Large Stock of A.C. and D.C. Equipment

LETTERS TO THE EDITOR

Use Square-Mile-Foot

To the Editor:

In computing runoff and reservoir capacity would not the square-mile-foot be superior to the acre-foot?

One square-mile-foot equals the flow of 0.884 cusecs (second-feet) for one year or a continuous output of about 1 hp at 10 ft head for one year (at 100% efficiency). This makes it a very convenient unit for quick appraisals and comparisons.

J. P. Thornton

943 Wilmer St
Victoria, British Columbia

• Reader Thornton's observation deserves consideration. An acre-ft equals about 0.00138 cusecs annually or a continuous output of about 0.00156 hp at a 10 ft head for one year.

Limit Switches

To the Editor:

Recently my attention has been called to a statement in "Technical Notes" in the February 18, 1952 issue of Electrical World. This particular statement is: "Limit switches are probably safer if they are connected in the power circuit than in the control circuit."

While this statement is undoubtedly technically correct, it might lead some users to believe that for most of their limit switch problems they have a choice of specifying either a control circuit type of limit switch or a power circuit type of limit switch.

At the present time, power circuit limit switches are used on some cranes and some elevators and in very few other applications. Most of them are used for emergency operation only. They are not generally so constructed that they can stand frequent routine operations.

Power circuit limit switch capacity has to be at least the same as motor capacity. If designed on the same basis as magnetic contactors, there would be about eight different sizes of power limit switches for each particular purpose. Each limit switch would have to have arc rupturing means for handling the locked rotor current of the motor in control.

Control circuit limit switches have proven themselves to be generally so satisfactory for practically all industrial purposes that when a user says "limit switch" he almost automatically implies a control circuit limit switch. As a matter of fact, this is so generally accepted that power circuit limit switches on crane hoists are generally called limit stops.

J. J. Mellon
Chief Engineer

Allen-Bradley Co
Milwaukee 4, Wis.

Corrosion in Arresters

To the Editor:

In the Dec. 24, 1951, issue of Electrical World under Technical Notes the statement was made that "Corona in arresters may result in nitrous oxide and ozone and corrode metal parts". This statement is correct as it stands, but it is a very broad one and may be misinterpreted.

Our experience does not indicate that the presence of nitrous oxide and ozone alone will corrode the metal parts of a lightning arrester spark gap. The presence of moisture is required to form a corrosive acid from nitrous oxide. The damaging effect if moisture is present has been known for many years. One of the most important factors in the construction of lightning arresters of the valve type is to prevent accumulation of moisture or the deposition of moisture in the series gap. In fact, whether or not nitrous oxide or ozone or both are present, moisture in the gap will cause trouble. This effect was the principal cause of radio interference troubles in lightning arresters that were built during the 1920's. The importance of adequate sealing of valve type lightning arresters was recognized in the early 1930's. Adequate seals then were developed in Autovalve lightning arresters. Furthermore, the practice was adopted of testing each lightning arrester unit regardless of size or type, by applying air or nitrogent pressure inside the arrester while the unit is submerged in water to detect any leaks in the seals or through cracks in the porcelain. This practice has been in use since the early 1930's.

There have been opportunities to examine many lightning arresters that have been in service for many years. The metal parts of the gaps in these arresters have been clean and bright and looked as new as when the arresters were built except for the traces that have been left by discharges in the field.

We have taken the liberty of calling this to your attention because it is possible that the unqualified statement made in Electrical World may cause needless apprehension among users. The matter of exclusion of moisture and the prevention of corrosion of the metal parts has not been a problem in Autovalve lightning arresters that have been manufactured during the past 20 years, whether the arresters are of the distribution type, line type, or the station type. This statement is made without reservation since it is borne out by service experience.

E. Beck, Manager
Lightning Arrester Section
Westinghouse Electric Corp
East Pittsburgh, Pa.

Look for the
Utility Merchandising Survey
★
Electrical World
March 24, 1952

Seeks Training Program

To the Editor:

On page 106 of the May 21, 1951 issue of Electrical World a short article entitled Symptomatic Operation referred to the training of generating station operators. It was suggested that a number of interesting and effective programs had been devised and successfully conducted.

Will you kindly send me the names of the operating companies who now have or have had such programs.

J. D. Waddell
Tech. Asst. to Exec. Vice Pres.
Iowa Southern Utilities Co
Centerville, Iowa

• In addition to Long Island Lighting Co, Delaware Power & Light Co, Central Hudson Gas & Electric Corp, and Niagara Mohawk Power Corp, who else conducts a training program?

Low-Cost 5/8% Step Regulator Line Distribution Extended

Time-tested JFR regulators can now be used on any feeder

THE EXTENSION of the Allis-Chalmers JFR 5/8% step voltage regulator line to cover five new ratings means that the initial cost of regulation has been reduced for many more feeders. Now you can get time-tested JFR's in the following ratings: 100 amps rated 7620 volts; 50 and 100 amps rated 5000 volts; and 100 and 200 amps rated 2500 volts.

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15 amp	50 amp	100 amp
50 amp	100 amp	200 amp
100 amp		

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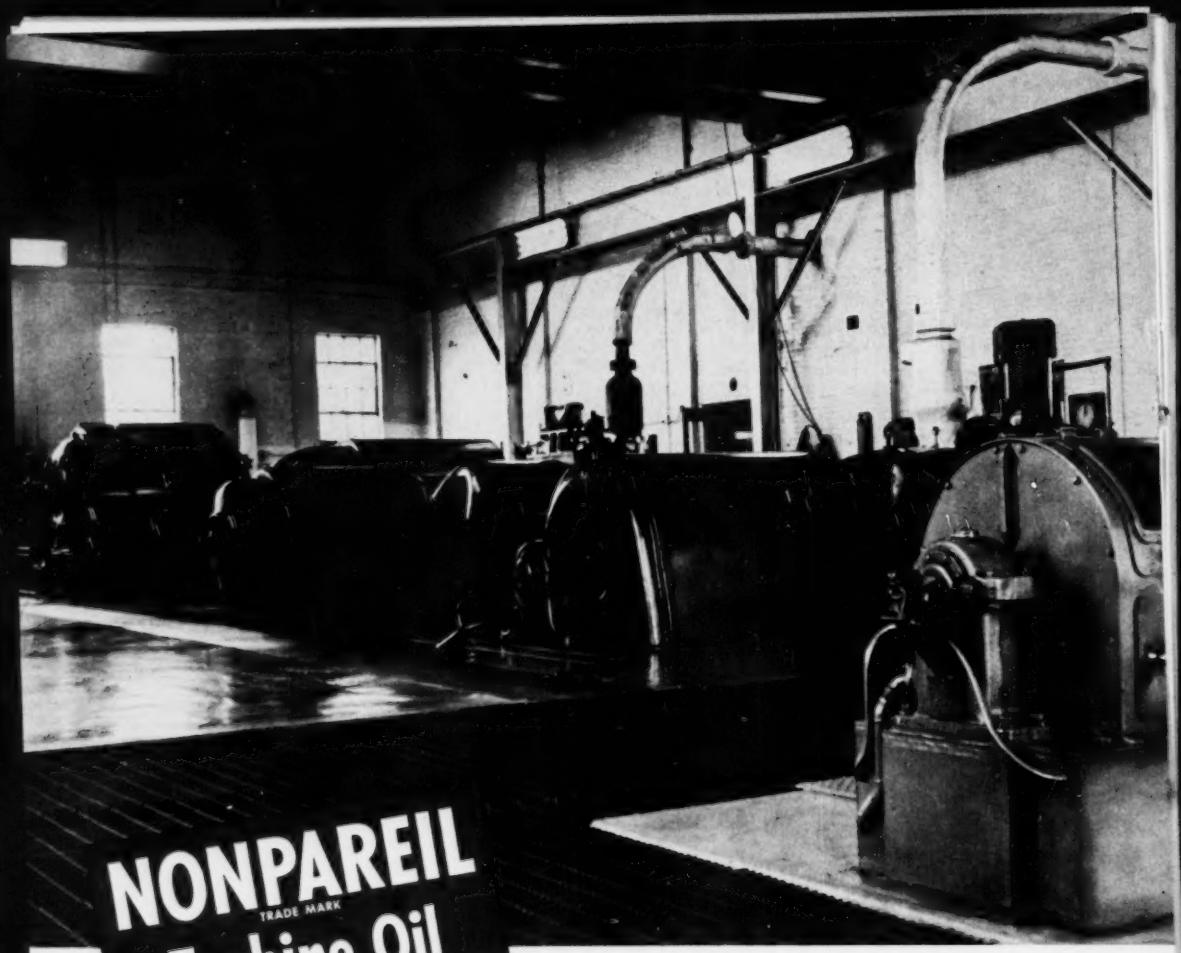

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